

FiT RAID SUBSYSTEM

User's Manual V1.2



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Chapter 1 Introduction to FiT RAID subsystem

Overview

Thank you for using **FiT** series RAID subsystem of AXUS Microsystems, Inc.

FiT RAID subsystem built-in the newest disk storage technology (Redundant Array of Independent/Inexpensive Disks) is ideal for integration with video and every creative system. RAID technology is the best method to protect your data, while providing greater I/O performance than a single hard drive. With RAID technology, **FiT** RAID subsystem offers superior performance for data I/O and high reliability for data protection. **FiT** RAID subsystem is also designed for easy to grab and go. Users can easily do editing anywhere with a portable RAID subsystem.

This user's manual will introduce the **FiT** series products. To get the latest information for the products, please visit AXUS official website www.axus.com.tw or contact your vendors.

Features & Specification

External RAID Subsystems

RAID Series	FiT 300		FiT 500		FiT 400-R	
Model number	FiT300E	FiT300F	FiT500E	FiT500F	FiT400E-R	FiT400F-R
Bay number	3		5		4	
Tower/Rack	Tower		Tower		1U Rack-Mount	
RAID Level	0/1/3/5/PM/LARGE/CLONE		0/1/10/3/5/PM/LARGE/CLONE		0/1/10/3/5/PM/LARGE/CLONE	
Event notification	Buzzer, GUI		Buzzer, LCD, GUI		Buzzer GUI	
Hot Swap Components	Hard Disk, Fan Module				Hard Disk	
Host Interface	eSATA/USB2.0	eSATA/ FireWire400&800/ USB3.0	eSATA/USB2.0	eSATA/ FireWire400&800/ USB3.0	eSATA/USB2.0	eSATA/ FireWire400&800/ USB3.0
Disk Interface	SATA/II		SATA/II		SATA/II	
HDD size	3.5"		3.5"		3.5"	
RAID Management	GUI / Rotary Switch		GUI / LCD / Rotary Switch		GUI / Rotary Switch	
AES Key	N/A	256-bit	N/A	256-bit	N/A	256-bit
Operating System	Windows / Linux / Mac OS (OS independent and transparent)					
Power Supply	90W(Adapter) , DC output: 19V ,4.74A Max.		220W		220W	
Electrical	AC Voltage 100~240 VAC / AC frequency 50~60 Hz					
Temperature	Operating temperature 5~35 ℃,None-Operating temperature : -40 ~60 ℃					
Relative Humidity	20% ~ 80% non-condensing					
Dimension (mm) WxDxH	140 X 237 x 115		140 x 242 x 208		446.4 x 396 x 43.2	
Weight (kg)	2.03		3.88		5.93	

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Inner RAID Cages

RAID Series	FiT300/500E-I	
Model number	FiT300E-I	FiT500E-I
number of 5 1/4" slot	2	3
# of drive in a 3.5" drive space	3	5
RAID Level	0/1/3/5/PM//Large/CLONE	0/1/10/3/5/PM//Large/CLONE
Eventlog notification	Buzzer / GUI	
Hot Swap Components	Disk Drive	
Host Interface	SATA	
Disk Interface	SATA/II	
HDD size	3.5"	
RAID Management	Rotary Switch / GUI	
AES Key	N/A	
Operating System	Windows /Linux / Mac OS (OS independent and transparent)	
Temperature	Operating temperature 5~35 ℃ ,None-Operating temperature : -40 ~60 ℃	
Relative Humidity	20% ~ 80% non-condensing	
Dimension (mm) WxDxH	148 x 233 x 84	148 x 233 x 127
Weight (kg)	1.61	2.46

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Features

- Easy plug & play installation on PC or Mac
- RAID rotary switch for quick setup
- Support eSATA 3Gbits, USB 2.0&3.0, FireWire 400&800
- Support several RAID modes & capacity > 2TB
- Graphic user interface "**FiT Manager**" for advanced management
- Easy to One Button Backup
- RAID volume encryption with AES key

Safety Precautions

FiT RAID subsystem is a delicate electronic instrument and is susceptible to damage due to excessive physical shock. Place **FiT** RAID subsystem in a vented area away from moisture or liquids. Do not open the case that may void the warranty. If the product is returned with any damage caused by improper operation, the warranty will be void. Users must read warnings as below:

- **Do Not** place **FiT** RAID subsystem on uneven or unstable work surface.
- **Do Not** expose **FiT** RAID subsystem to liquids, rain or moisture.
- **Do Not** use attachments not contained in shipping box.
- **Do Not** use accessories not recommend by the manufacture of **FiT** RAID subsystem.
- **Must** read User's Manual carefully and follow the instruction when setting up **FiT** RAID subsystem.

System Requirements

Computers with eSATA3.0Gb, USB2.0/3.0 or FireWire400/800 interfaces. About systems support RAID volumes beyond 2TB and multiple volumes (port multiplier), please refer to the compatibility list and white paper from AXUS for more information.

Box Contents

➤ External RAID Subsystems

- **FiT** RAID Subsystem x 1
- HDD Trays x 3 (for **FiT300E/F** only)
- HDD Trays x 4 (for **FiT400E/F** only)
- HDD Trays x 5 (for **FiT500E/F** only)
- Slide Rail x 1 (for **FiT400E/F** only)
- Fan Module x 1 (**not** for **FiT400E/F**)
- 90W Power Adapter x 1 (for **FiT300E/F** only)
- Power Cord x 1
- SATA to eSATA Cable Kit x 1
- eSATA to eSATA cable x 1
- USB2.0 Type A to B cable x 1 (for **FiT300E/400E/500E** only)
- USB3.0 Type A to B cable x 1 (for **FiT300F/400F/500F** only)
- FireWire400-400 cable x 1 (for **FiT300F/400F/500F** only)
- FireWire800-800 cable x 1 (for **FiT300F/400F/500F** only)
- AES Key x 1 (for **FiT300F/400F/500F** only)
- User's Manual & software CD x 1
- Quick Installation Guide

➤ Inner RAID Cages

- **FiT** Inner Cage x 1
- HDD Trays x 3 (for **FiT300E-I** only)
- HDD Trays x 5 (for **FiT500E-I** only)
- Fan Module x 1 (pre-installed for **FiT500E-I**)
- SATA to SATA cable x 1
- User's Manual & software CD x 1
- Quick Installation Guide

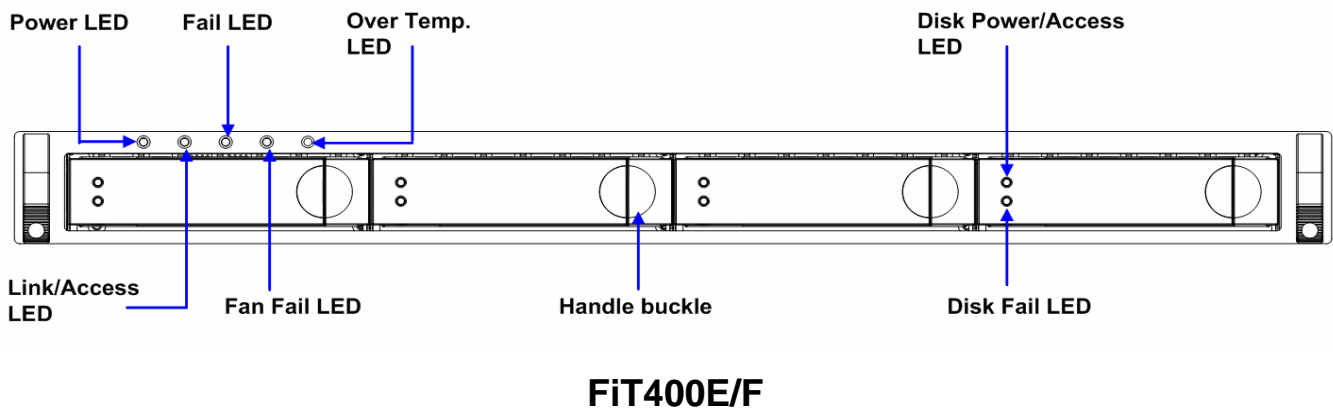
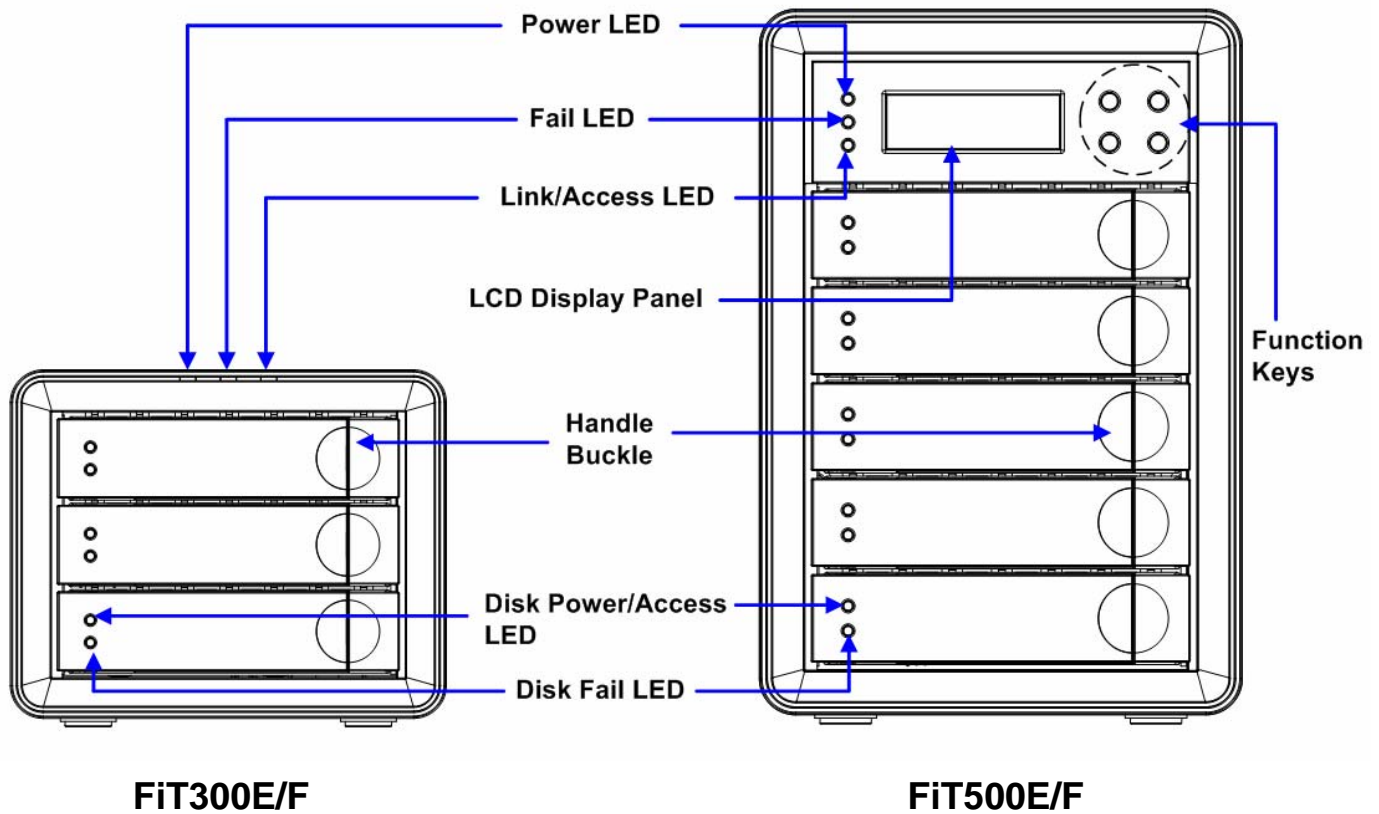


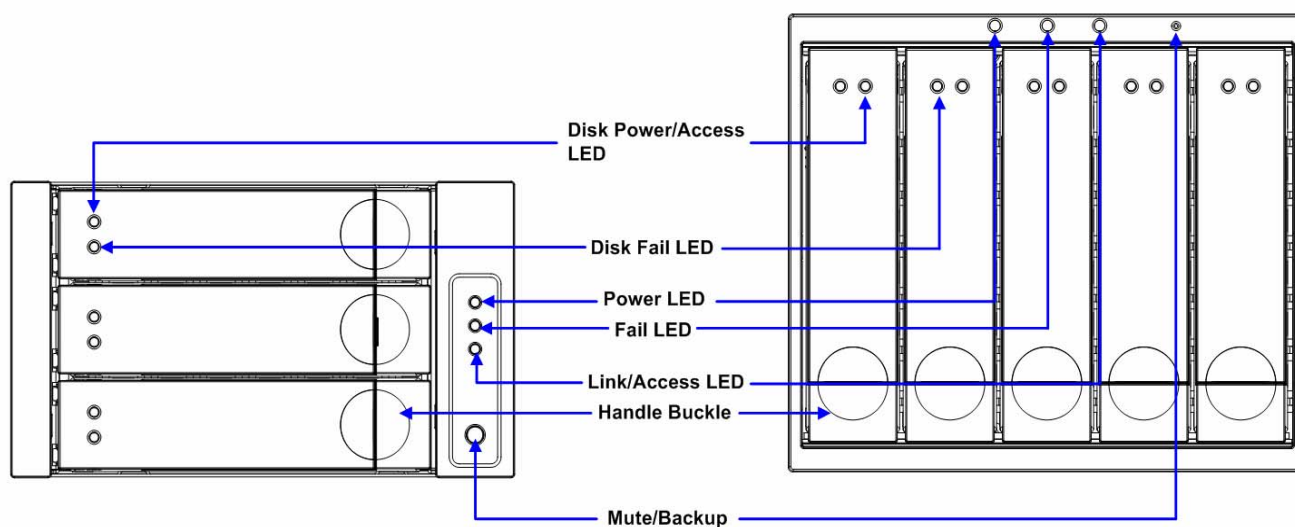
NOTE!








FireWire 400 (by Apple) is also known as IEEE1394a
FireWire 800 (by Apple) is also known as IEEE1394b

Chapter 2 FiT RAID subsystem I/O & modules

Front View



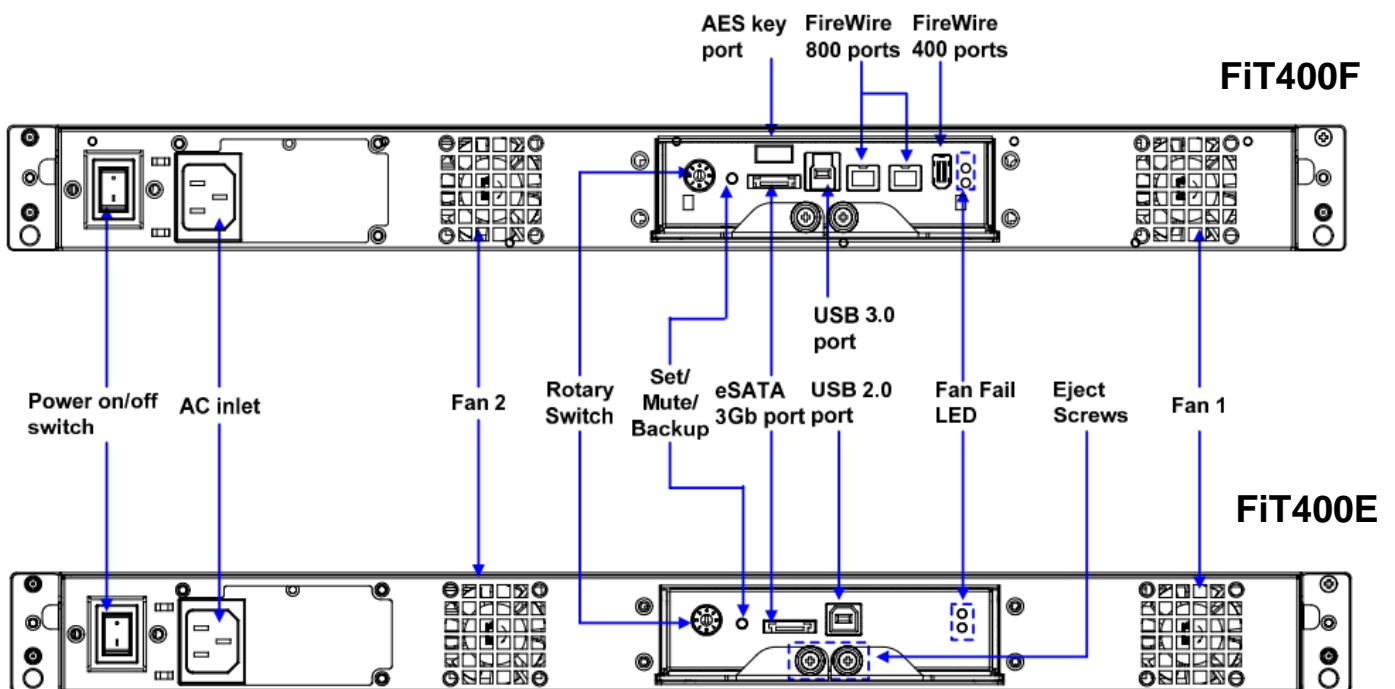
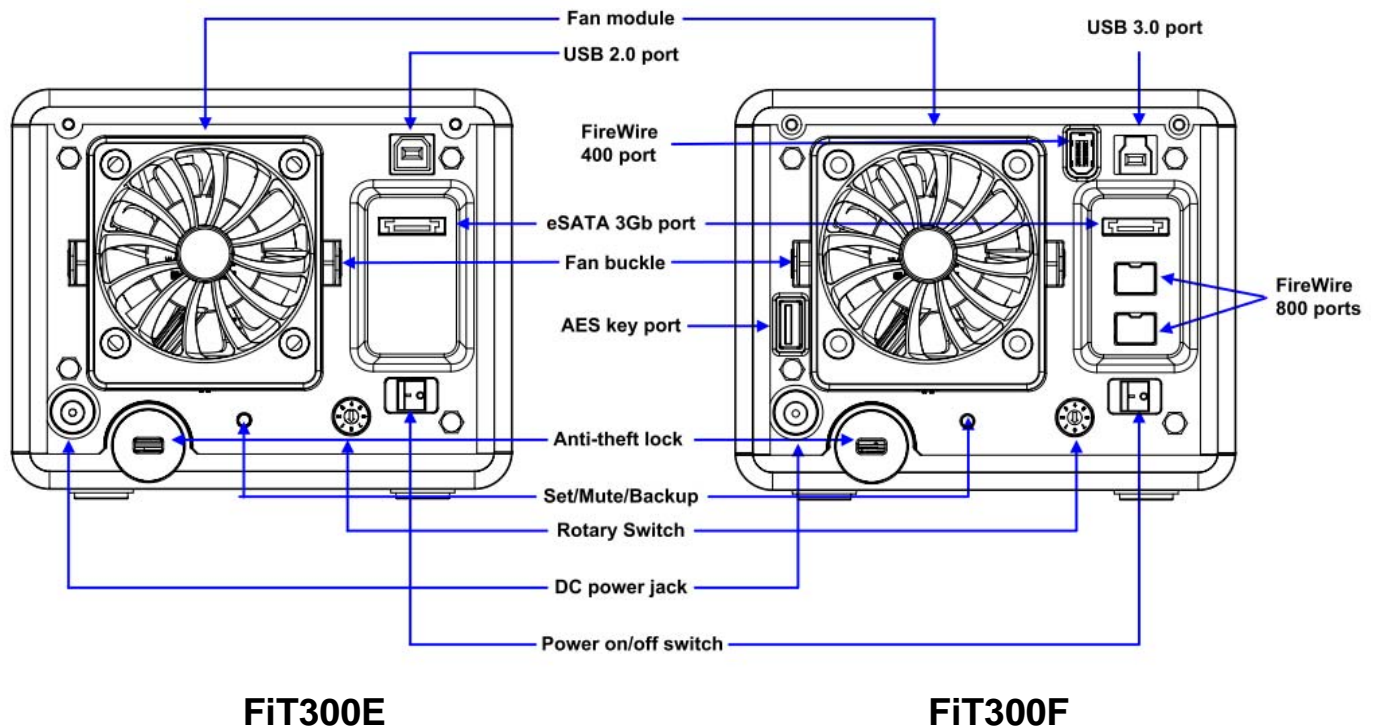
**FiT300E-I****FiT500E-I**

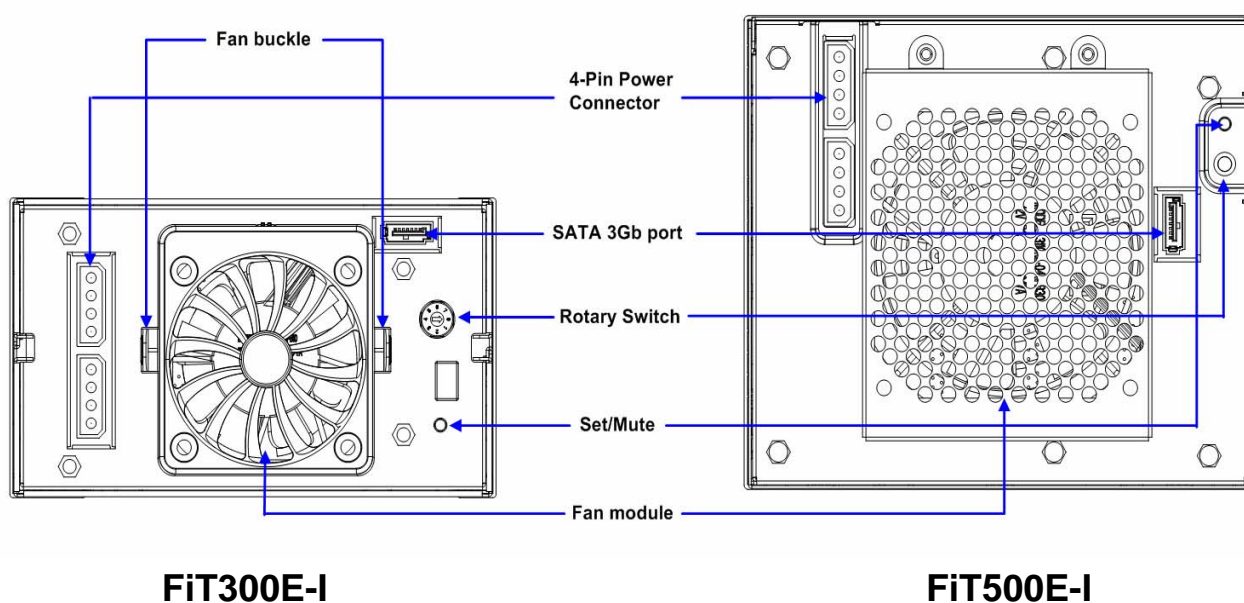
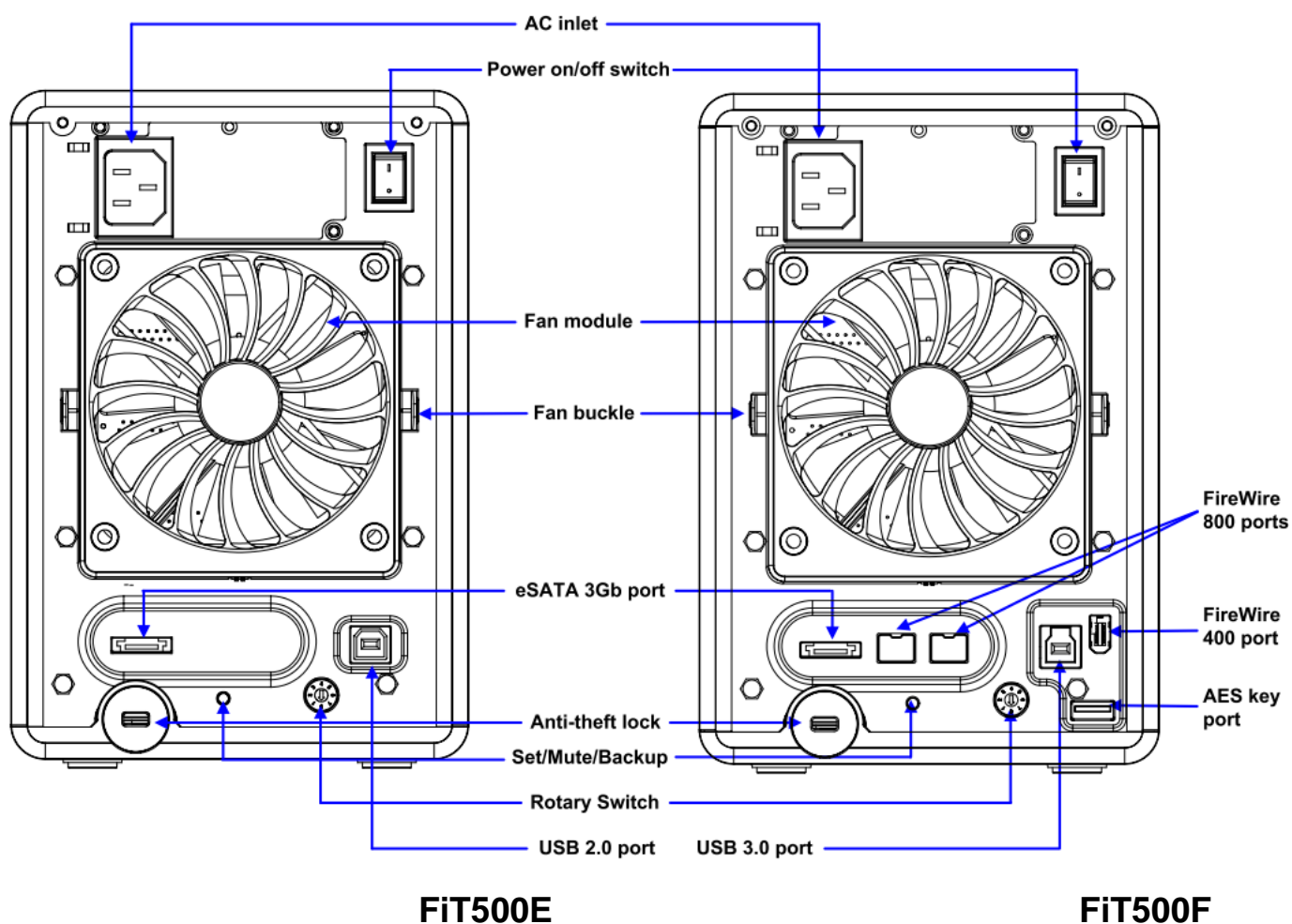
LED Status	Power		LED is "Blue" when the system is power on.
	Fail		LED is "Red" when system or hardware is failed.
	Link/Access		LED is "Blue" when system links to a computer machine; LED is blinking as "Blue" when data is accessed.
	Fan Fail (For FiT400E/F only)		LED is "Yellow" when one of fans is failed.
	Over Temp. (For FiT400E/F only)		LED is "Yellow" when FiT RAID subsystem's temperature is abnormal.
	Disk Power /Access		LED is "Blue" when disk is normal; LED is blinking as "Blue" when data is accessed.
	Disk Fail		LED is "Red" when disk is failed.

**IMPORTANT!**

See "events" to get more detail about failure information

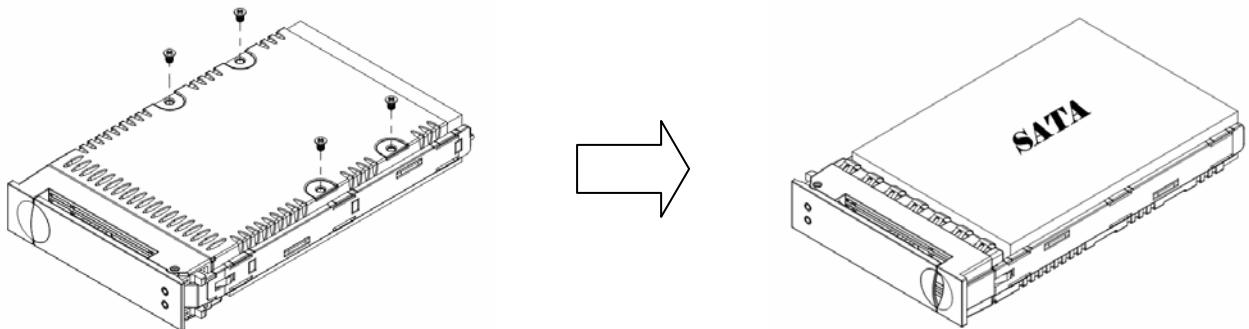
Rear View



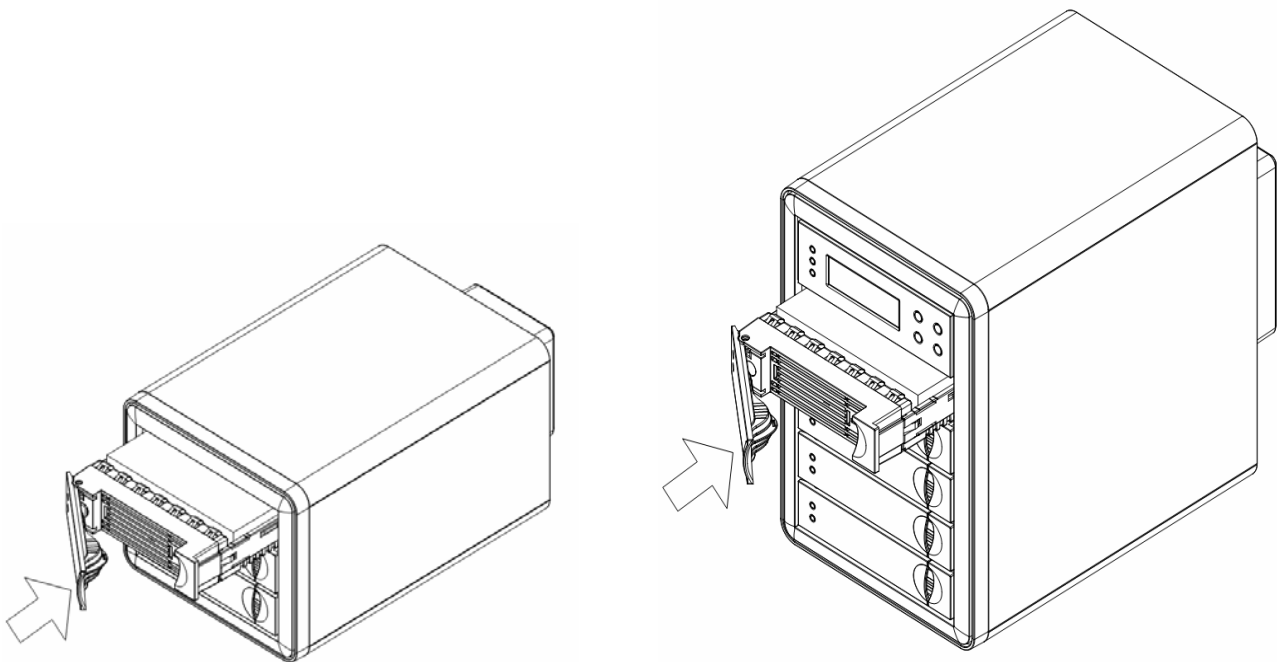


Hard drive tray

Install your disk in the hard drive tray. Make sure to fasten the hard disk securing screws to prevent damages caused by unnecessary movement.

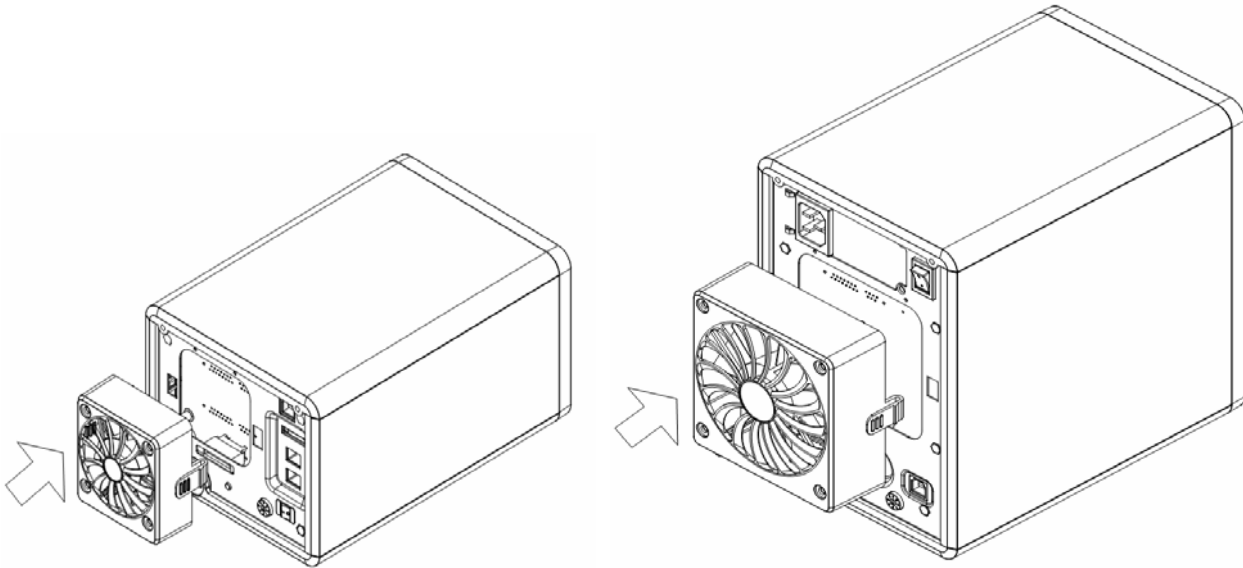


Insert the hard drive tray into your **FiT** RAID subsystem then make sure the tray handler is locked.



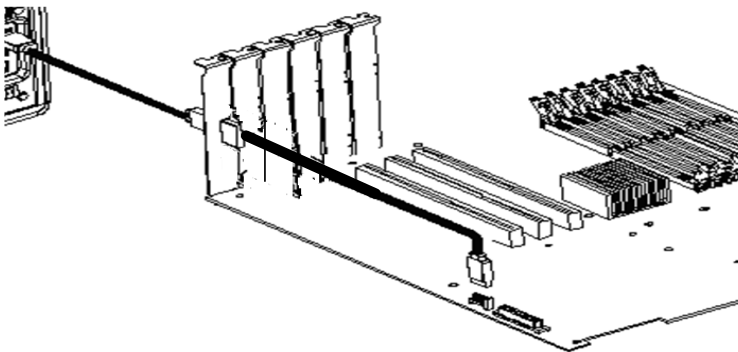
Fan module

Fan module supports hot swap function which allows users to replace the broken fan without turning off **FiT RAID** subsystem.



SATA to eSATA Cable Kit

Screw the SATA to eSATA kit on the host computer then connect it to the SATA connector on the motherboard.



NOTE!

To get more stable SATA signal, users can install an eSATA re-driver card or eSATA HBA (both optional by AXUS) in the host computer.

Chapter 3 Setup your FiT RAID Subsystem

About RAID mode

RAID (Redundant Array of Independent/Inexpensive Disks) technology utilizes the mechanisms such as Striping, Mirroring and Parity Checking, to employ two or more physical hard drives (equal capacity) in one logical disk array. Disks in an array can be of different capacities, but RAID treat them as if they all have the same capacity of the smallest physical disk. With RAID technology, the storage device can provide a huge capacity, increase input/output performance and data reliability. If one of the hard drives in the array is failed, the system would continue to operate with the remaining working hard drives to avoid any system crash or data loss.

FiT RAID subsystem provides seven modes of RAID volume, which are described as below:

RAID 0 (Striping): RAID 0 provides advanced I/O performance and large storage capacity but no fault tolerance. Because when the data is written to a RAID 0 disk array, the data is broken into fragments which are written to RAID 0 member disks simultaneously on the same sector. Therefore, failure of any single member disk would destroy the entire disk array. RAID 0 requires at least two disks and more disks in an array would offer better performance but also increase the risk of data loss. **Once one of array member disks is failed, the whole RAID 0 volume would be failed.**

RAID 1 (Mirroring): RAID 1 provides fault tolerance from disk errors and failure of a single member disk. The data written to one disk is simultaneously written to another disk. Read performance may be enhanced if the array controller can parallel accesses both members of a mirrored pair. There would be a minor performance reduction when compared writing to a single disk. If one disk fails, all data is preserved on the other disk. RAID 1 requires two disks which offers extremely high data reliability, but it costs half of storage capacity to backup data. **RAID 1 allows one of array member disks failed without data loss.**

Large: Large provides the largest capacity but without performance enhancement and fault tolerance. The entire capacity of each member disk would be consumed for Large volume. But **once one of array member disks is failed, the Large volume would be failed.**

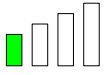
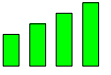
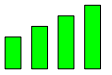

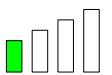
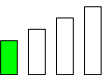


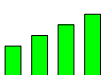
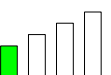

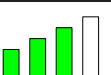
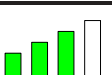
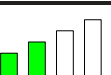
RAID 3 (Striping with dedicated parity): RAID 3 provides disk striping and complete data redundancy with a dedicated parity disk. RAID 3 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks, and then writes the blocks to all but one disk in the array. The parity data created during the exclusive-or is then written to the last disk in the array. If a single disk fails, data is still available by computing the exclusive-or of the contents in the corresponding stripes of the surviving member disks. RAID 3 requires at least three disks and it is best for

applications that require very fast data-transfer rates or long data blocks. **RAID 3 allows one of array member disks failed without data loss.**

Clone: Clone makes an exact copy of the disk onto other spare disks which is similar to mirroring. Each of member disks stores the same data which provides better data reliability than RAID 1 for users. The cost of the great data reliability is users can only use the smallest capacity of member disks in an array. **Clone allows data access as long as either one of member disks is on-line.**

RAID 5 (Striping with distributed parity): RAID 5 provides disk striping and complete data redundancy with distributed parities in the disk array. Different from RAID 3, the parity data is written to all of the disks in an array rather than concentrated on a dedicated parity disk. If one disk fails, the parity data can be used to reconstruct the data from other surviving member disks. All disks in the array can be used to seek operation at the same time, which greatly increases the performance of the RAID volume. **RAID 5 allows one of array member disks failed without data loss.**

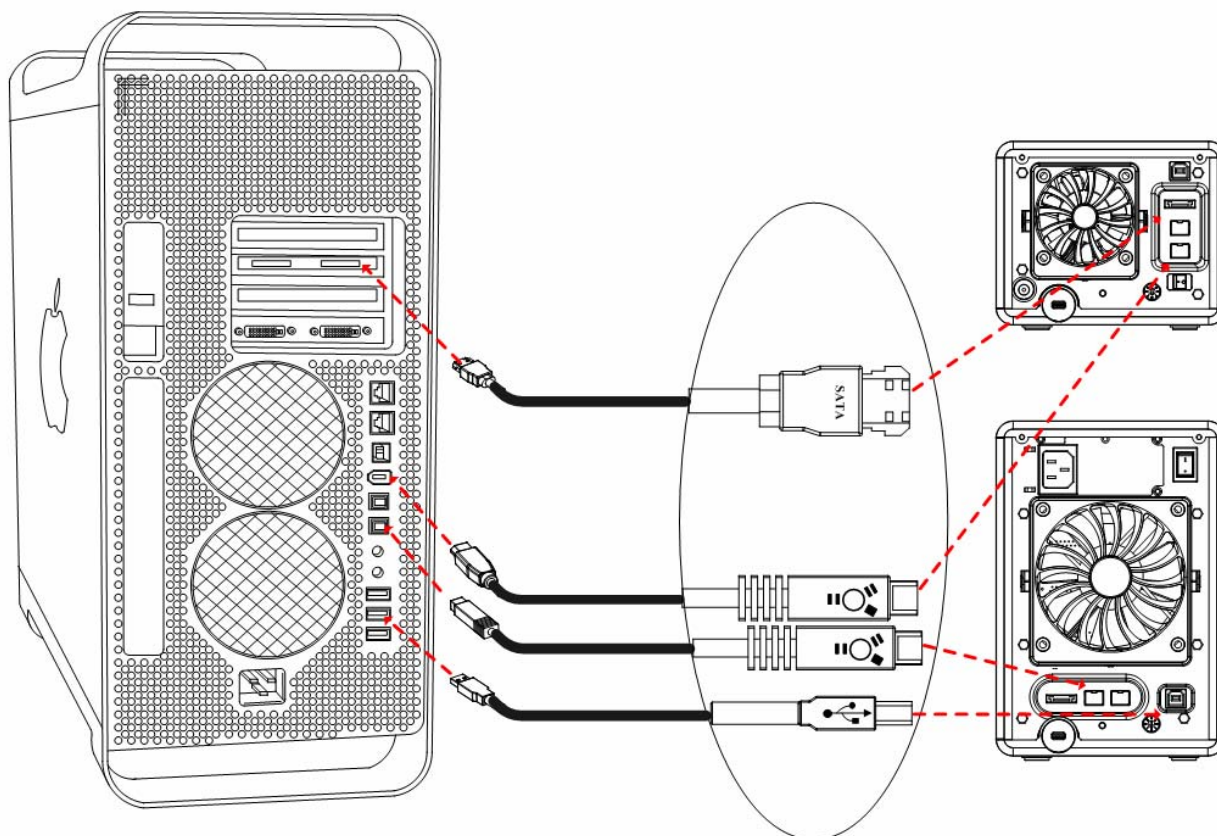
RAID 10: RAID 10 is a combination of multiple RAID 1 arrays with striping. It uses an even number of disks and combines features of both striping and mirroring. Striping helps to increase capacity and performance without adding disks to each RAID 1 array. **RAID 10 allows one disk failed in each sub-array without data loss.**

RAID mode	RAID Volume Capacity	Data Reliability	Data Transfer Speed	Minimum # of HDDs
R0	(Capacity of smallest disk) x N*			2
R1	Half capacity of two hard drives			2
Large	Total capacity of all hard drives			1
R3	(Capacity of smallest disk) x (N-1)			3
Clone	Capacity of smallest disk x 1			2
R5	(Capacity of smallest disk) x (N-1)			3
R10	(Capacity of smallest disk) x N/2			4

* N is the number of array member disks.

Connect FiT RAID subsystem to the host computer

FiT RAID subsystem supports multiple interfaces connected to the host computers (PC or MAC). In the meantime, users can only access data via either one of following interfaces: eSATA, USB 2.0 or FireWire400/800. For example, below figure shows how interface cables connected between MAC computer & **FiT300F/500F**.



Over 2TB & Multiple Volumes (Port Multiplier)

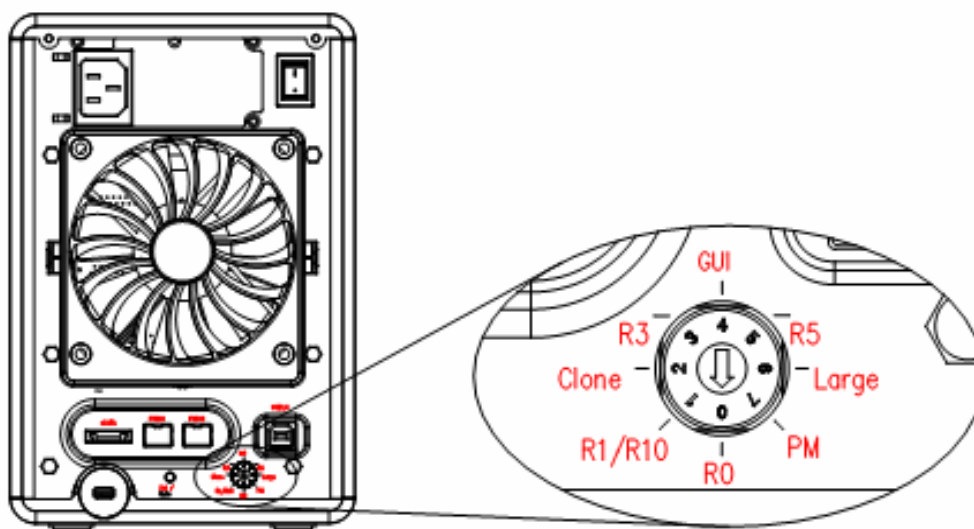
FiT RAID subsystem supports the capacity of RAID volume larger than two terabytes and multiple volumes. However, it also needs support from hardware, driver and operating systems of host computers. Therefore, capability of over 2TB and multiple volumes may not be practiced due to different operating systems and compatibility of motherboards. Please refer to the compatibility list and white paper from AXUS for more information.

Configure FiT RAID subsystem

After the hardware installation, the hard disks installed to **FiT** RAID subsystem must be configured before they are ready to use. This can be accomplished by either one of the following methods:

Quick Setup by switch

FiT RAID subsystem supports a RAID rotary switch at rear for setting up your RAID volume immediately. RAID rotary switch is the fastest way to create the RAID volume. By setting up the RAID rotary switch, users can easily create a RAID volume without GUI. Although hard disks of different capacity may be used in an array, **FiT** RAID subsystem would use the smallest capacity of the disk drive as the capacity of all disk drives in a RAID volume. The configurations of RAID rotary switch show as follow:



No. 0~7 present different RAID modes supported by **FiT** RAID subsystem. Turn the RAID rotary switch to the RAID mode which you want to create. Hold pressing the “setting/mute/backup” button and power on **FiT** RAID subsystem. Release the button about 5 seconds after **FiT** RAID subsystem startup. **FiT** RAID subsystem would consume all of hard drives you inserted to create a single RAID volume. About RAID technology features please see chapter “About RAID mode”. Each RAID mode is described as below:

R0 (0) – Create a RAID 0 volume.

R1/R10 (1) – Create a R1/R10 volume. If at least four hard disks are inserted, R10 volume would be created.

Clone (2) – Create a clone volume. All of hard disk is backup to each other.

R3 (3) – Create a RAID 3 volume.

GUI (4) – Create RAID volumes via **FiT Manager**.

R5 (5) – Create a RAID5 volume.

Large (6) – Create a big volume without RAID feature.

PM (7) – Delete RAID volume and each hard disk would be regarded as a single device (JBOD).

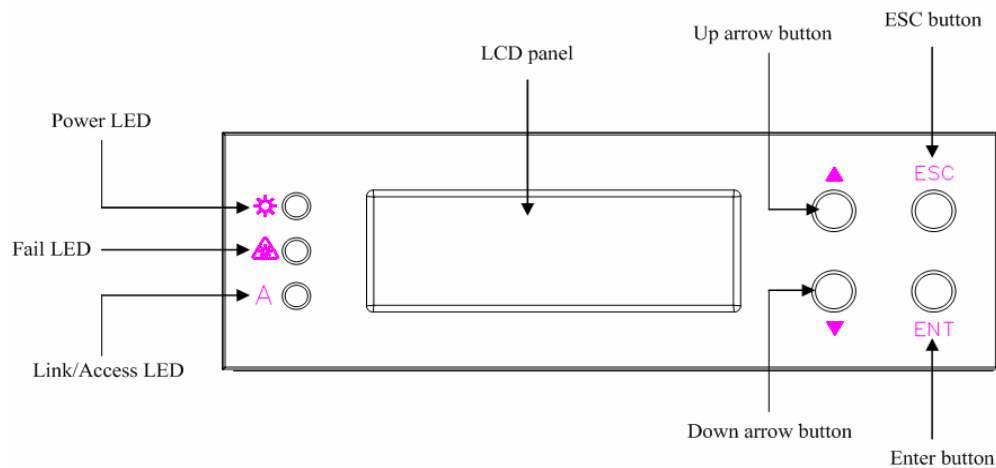


IMPORTANT!

RAID volumes must be deleted before re-creating a new volume by the RAID rotary switch.

LCD Panel (for FiT500E/F only)

FiT500E/F supports a touch-control keypad and a liquid crystal display (LCD) mounted on the front of the machine. It is an operational interface and monitor display which controls all configuration and management functions for **FiT500E/F**.



Starting LCD Configuration Utility

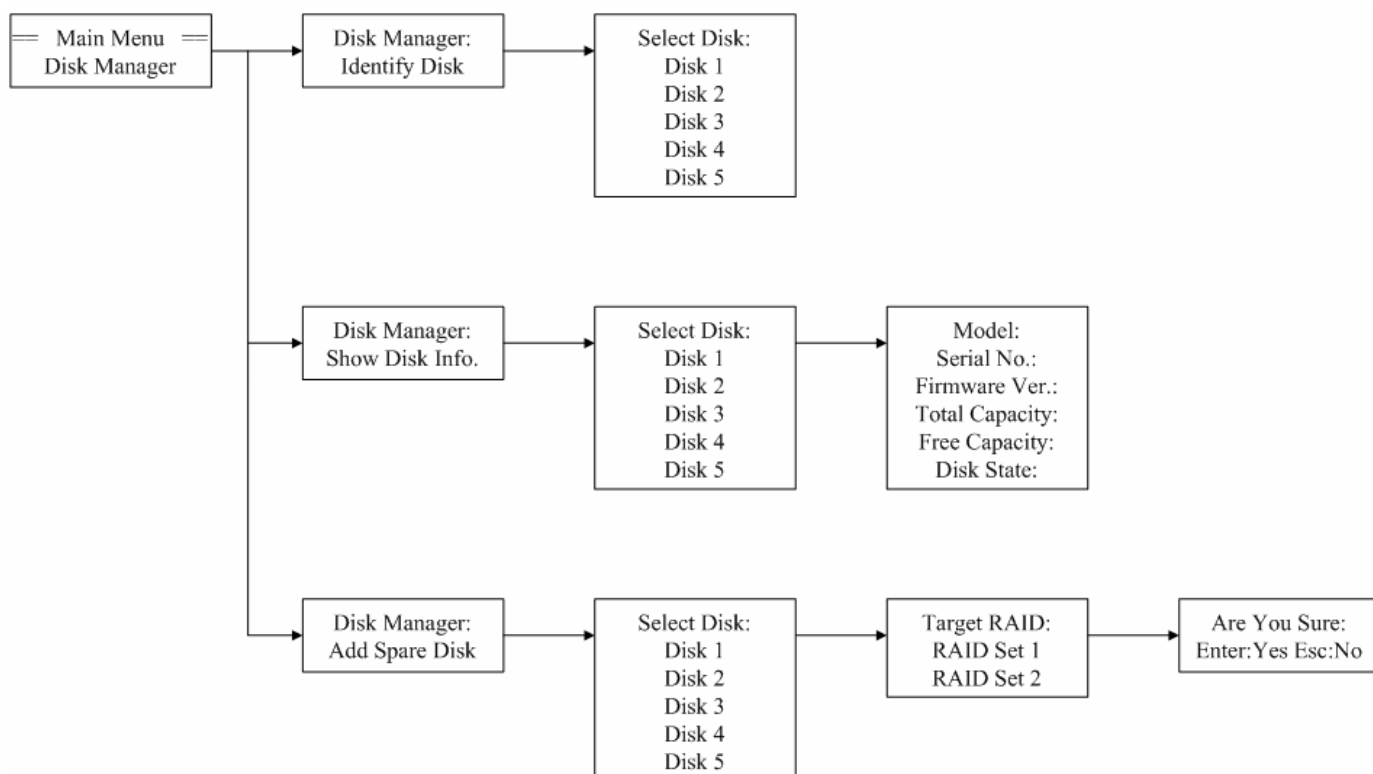
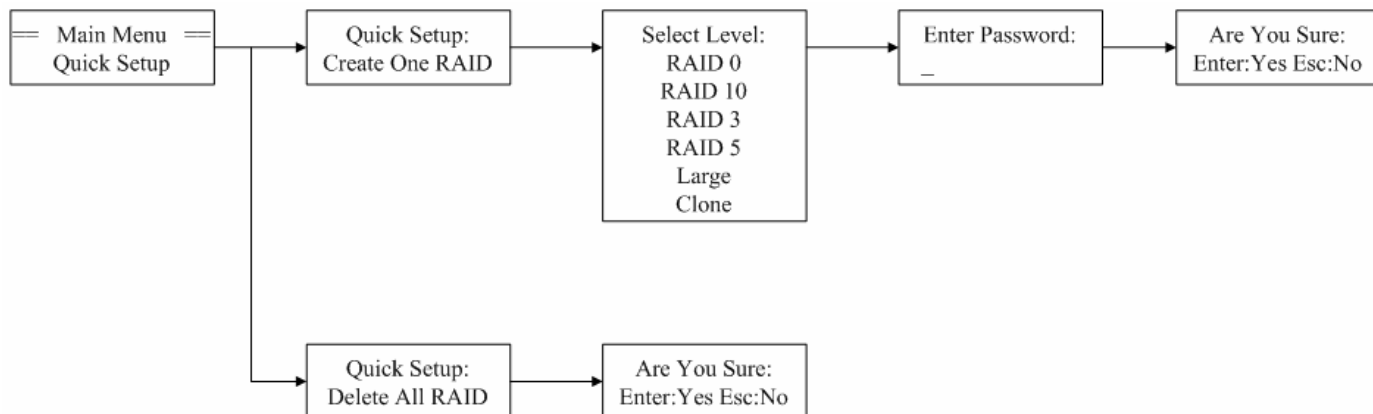
When power on **FiT500E/F**, “**AXUS Microsystem FiT500E/F**” displays on LCD panel. Press any button to enter Main Menu. Main Menu contains four sub-menus and users can use function buttons to manage **FiT500E/F**.

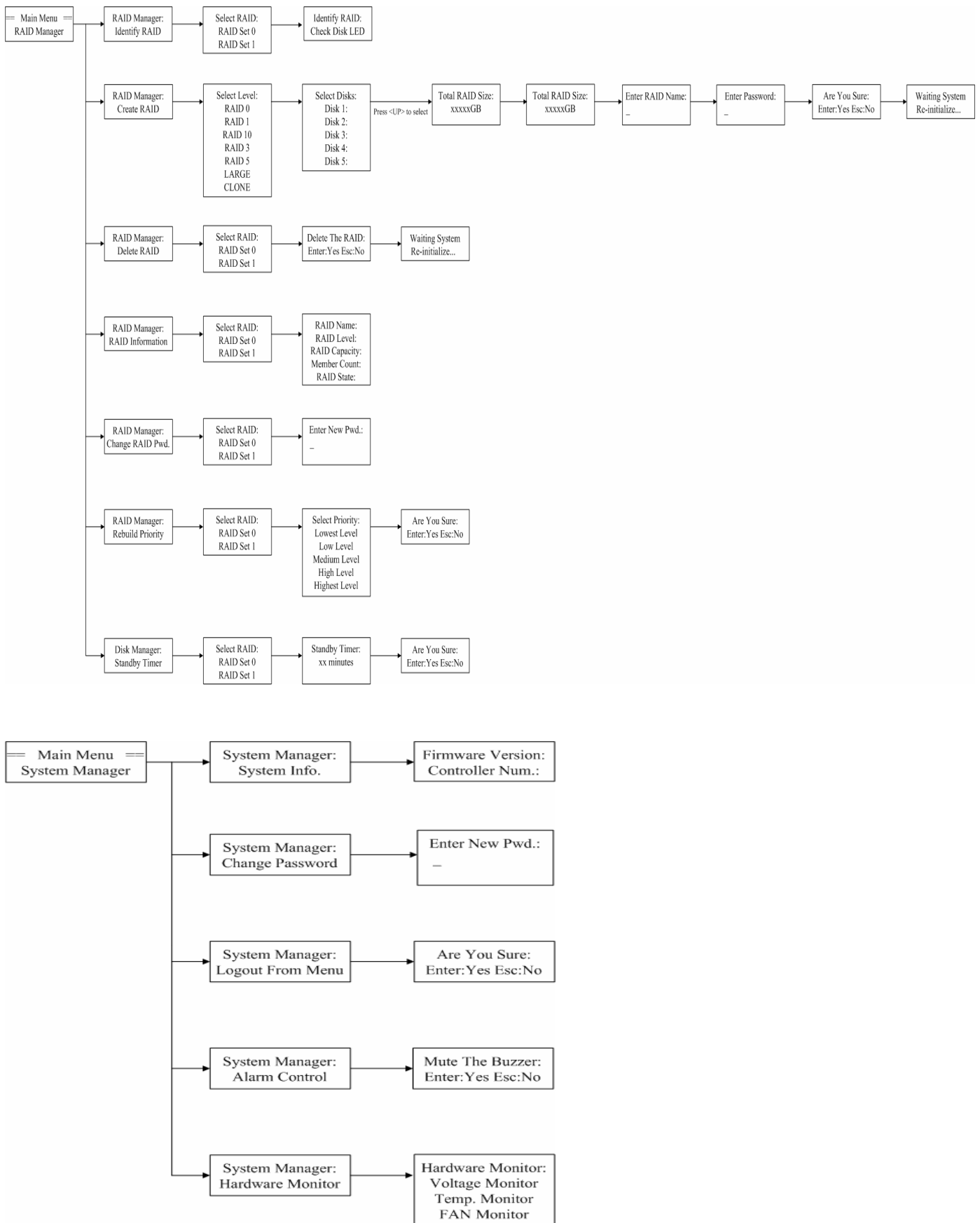
Press the UP/DOWN to move to forward and backward/select menu items. Press ENT to select the menu items.

Press ESC to return to previous menu item.

Configuring FiT500E/F

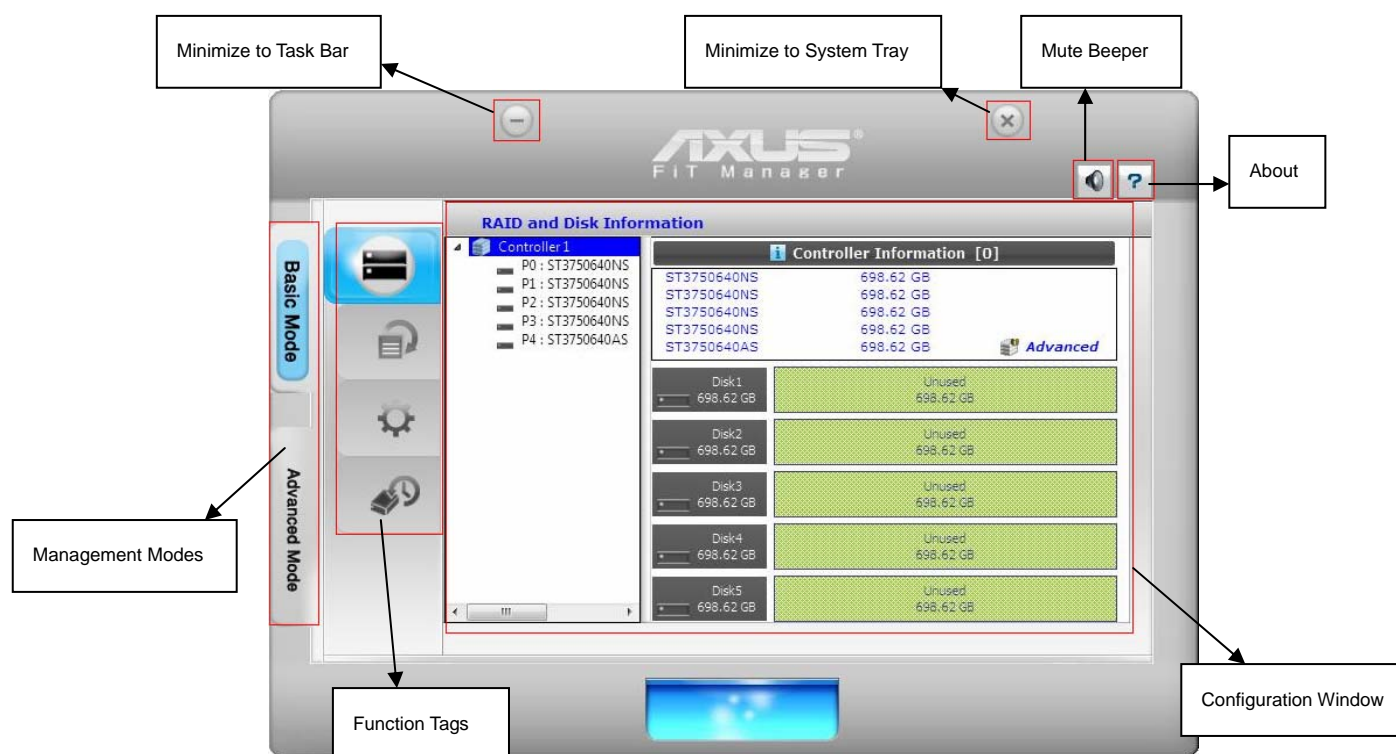
Below is the configuration menu tree of **FiT500E/F**, and follow the menu to complete RAID volume settings:





GUI — FiT Manager

FiT Manager is a management utility for users to administrate one or multiple **FiT RAID** subsystems attached to the host computer. Users need to install **FiT Manager** on their PC or MAC where **FiT RAID** subsystem is connected to. **FiT Manager** provides a simple graphic user interface that users can easily create volumes, monitor hardware status, check event logs and upgrading the firmware, etc. There are two modes in **FiT Manager**: Basic Mode and Advanced Mode. In Basic Mode, some basic functions are available, such as hard disk information, viewing event logs, creating a RAID volume and setting one button backup. If you want to configure more administration functions: Email Notification, Upgrading Firmware and System information, you have to setup configurations in Advanced Mode.




NOTE!

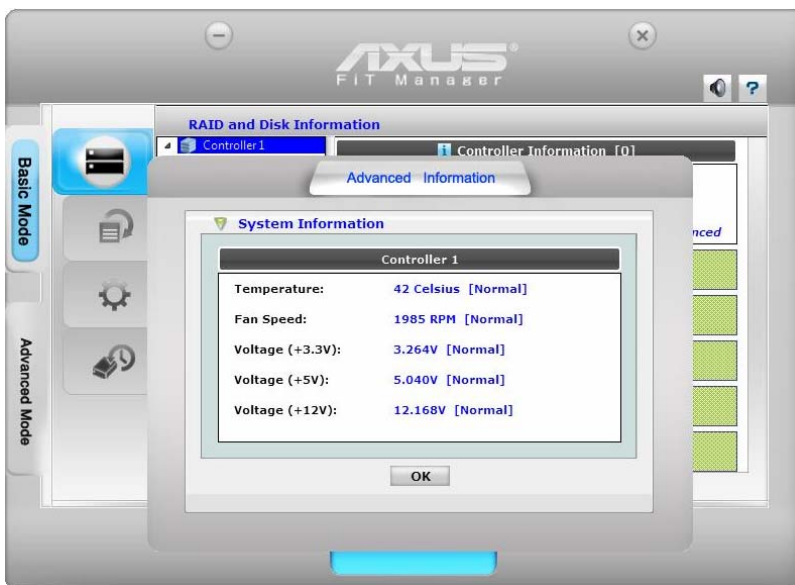
Refer to “read me” for installing **FiT Manager** in different operating systems.



Basic Mode

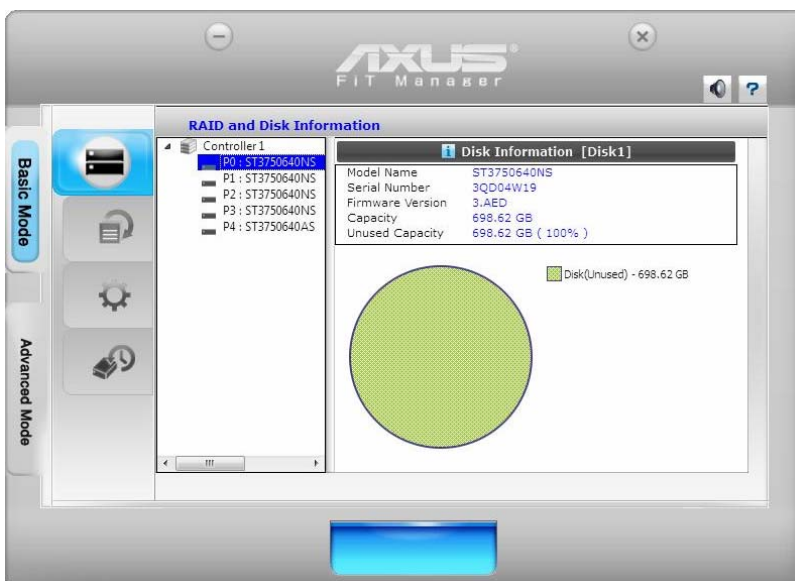
Four function tags at left side: RAID and Disk Information, Event Log Viewer, Basic RAID Configuration and One Button Backup Settings. Central window shows the main configurations of **FiT RAID** subsystem.


■ RAID and Disk Information

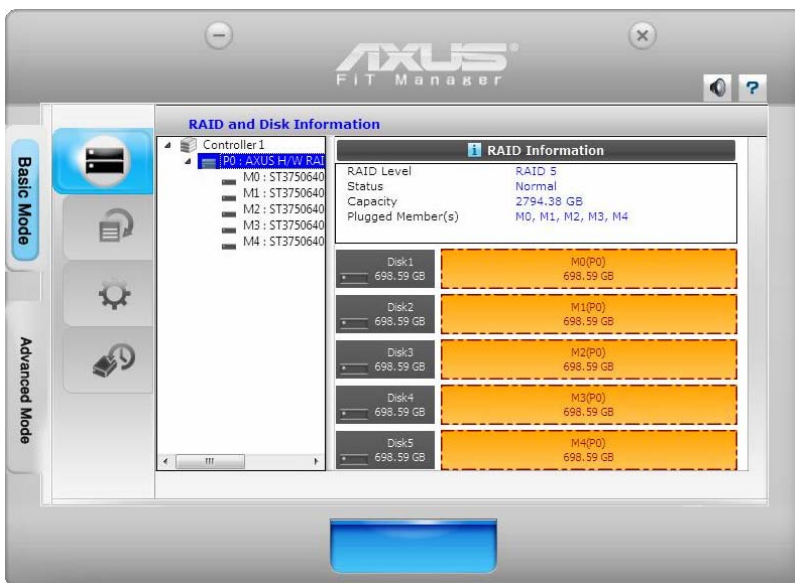
RAID and Disk Information provides users the information about FiT controller, physical disks and RAID volumes. To identify the controllers, RAID volumes and hard disks, click the  information bar at top and the related disk power LED would flash. Users can also check the current status of RAID volumes.




Click  to select the FiT controller for detailed information. Click  **Advanced** to show the FiT hardware information, such as system temperature, fan speed and voltage value.



Click  to show the disk information and unused capacity. P0 (Port0) presents the slot 1 physical disk (Disk1); P1 (Port1) presents the slot 2 physical disk (Disk2) and so on.



If a RAID volume is created, click  to show the RAID volume information. M0 presents the member disk 1 of the RAID volume; M1 presents the member disk 2 of the RAID volume and so on.

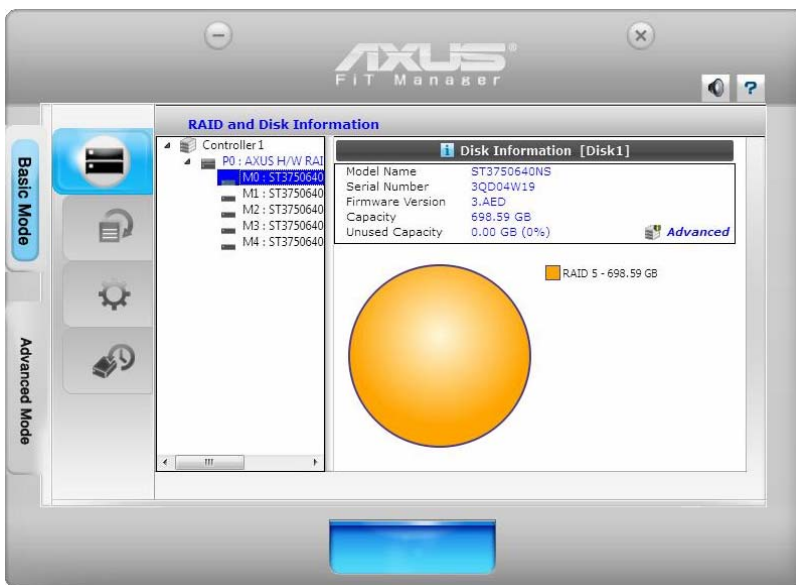
RAID Information includes:


RAID Level	Shows the RAID mode of the RAID volume
Status	Normal: RAID volume is working without failed any member disk
	Degrade: One or more disks are failed but the RAID volume still can be accessible with data redundancy
	Broken: RAID volume is inaccessible because the number of failed disks are more than RAID tolerance
	Rebuilding: Degrade RAID volume is rebuilt with a spare disk
Capacity	Shows the total capacity of the RAID volume
Plugged Member(s)	Shows the members disks grouped into a RAID volume

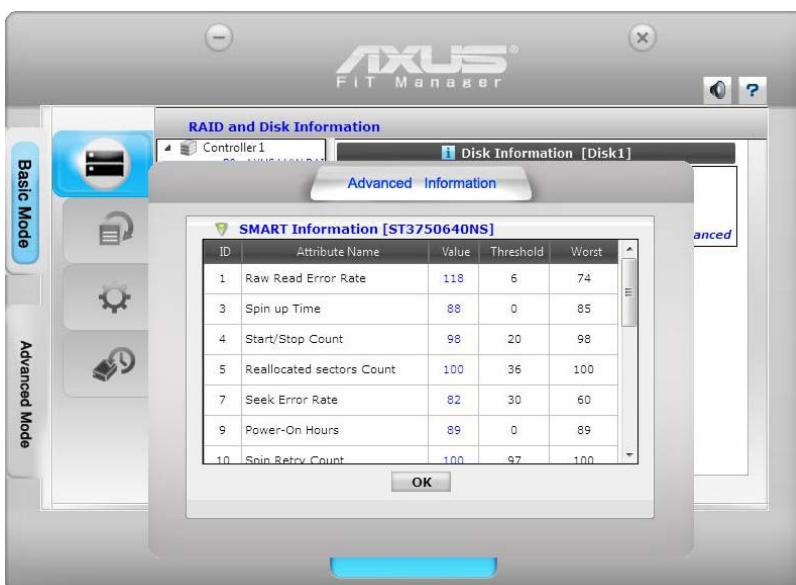



IMPORTANT!

If you want your RAID volumes with encryption feature, must read p.34 “Key Management” before creating volumes.



Click  to show the disk information and unused capacity of RAID member disks.



Click  **Advanced** to check the SMART information of each RAID member disk.

■ Event Log Viewer

Event Log Viewer records all events happen in **FiT** RAID subsystem. Logs include issued module, date, event type and detailed message.



Click **Save To File** to save logs as a text file or click **Clear** to delete all events.

■ Basic RAID Configuration

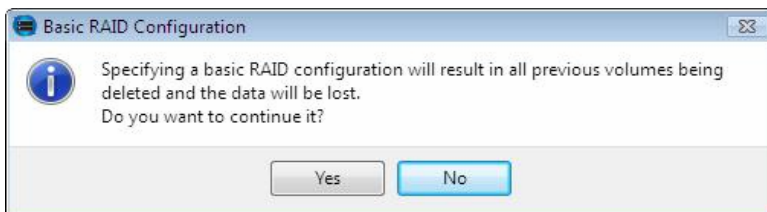
In “Basic RAID Configuration”, users can only create a single RAID volume. **FiT** RAID subsystem consumes all of hard disks which are inserted to create a RAID volume.



Select one of RAID modes in “Configure RAID”. Red section presents the capacity used by RAID volume and the green section presents the unused capacity. Click **Cancel** if you want to stop creating RAID volume.



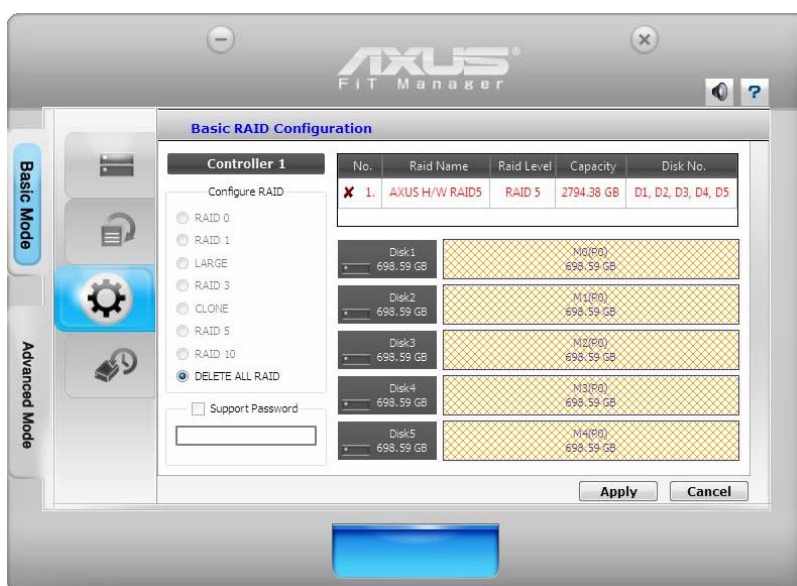
Check with “Support Password” to enable RAID volume protection. Once the option is enabled, **FiT** RAID subsystem would request correct password when users want to delete the RAID volume. The password supports up to 8 characters.



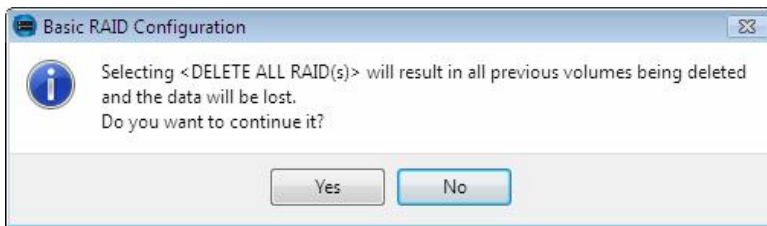
Click **Apply** to start creating RAID volume and a confirmation window would pop out. Click **Yes** to complete the configuration or click **No** to stop the procedure.



Once the RAID volume is created successfully, an information message would pop out and click “OK”. The RAID volume information which includes RAID level, capacity and member disks shows at top.



To delete RAID volumes, select “DELETE ALL RAID” in “Configure RAID”. The RAID volume information would show as red and come with an X mark. Click **Cancel** if you want to stop deleting RAID volumes.



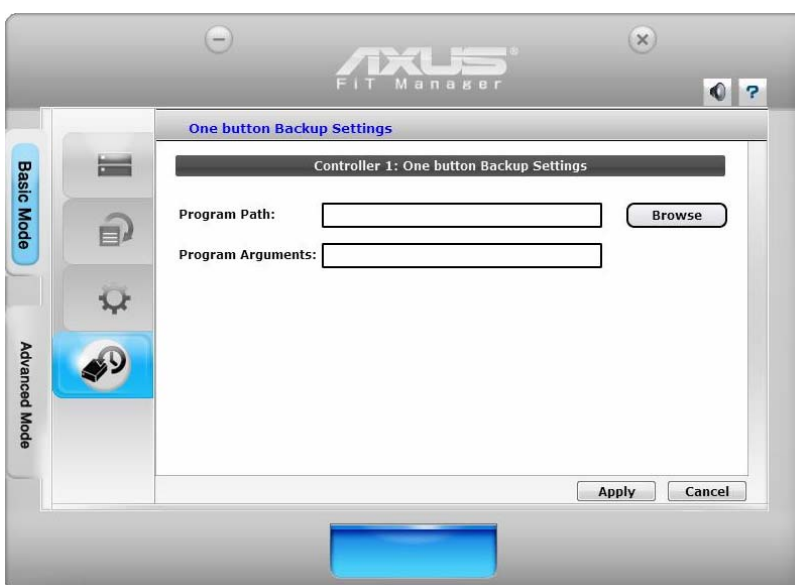
Click **Apply** to proceed deleting RAID volume and a confirmation window would pop out. Click **Yes** to complete the configuration or click **No** to stop the procedure.



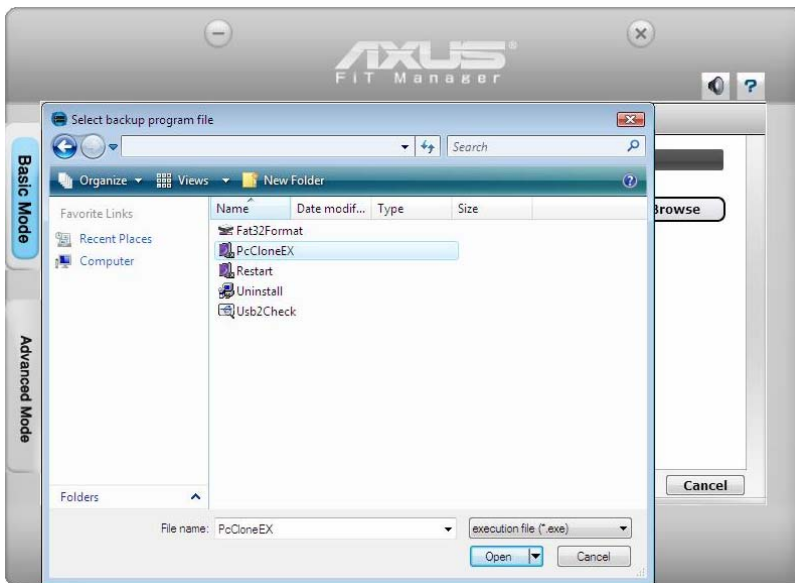
Once the RAID volume is deleted successfully, an information message would pop out and click "OK".

■ One Button Backup Settings

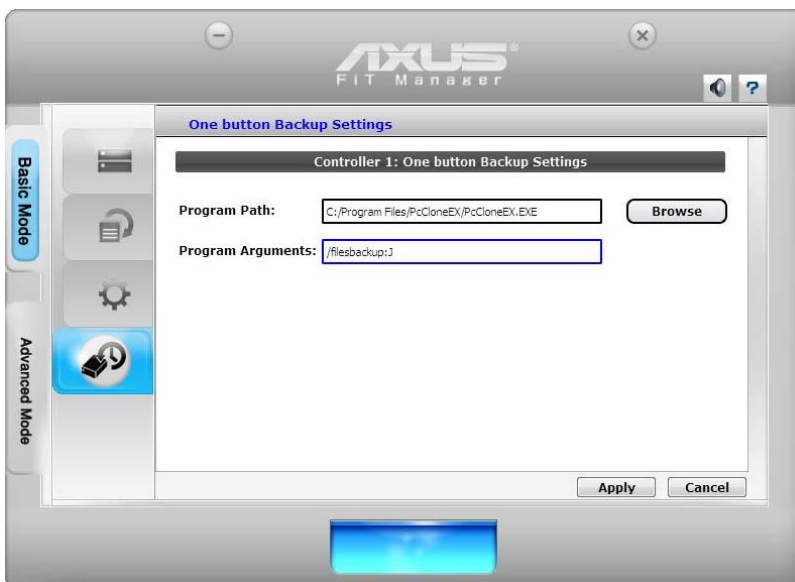
FiT RAID subsystem supports users to easily backup folders and data from host computer to FiT RAID subsystem. Once complete "One Button Backup Settings", users can just push "Set/Mute/Backup" button and the backup application would automatically start to backup specific folders and data into FiT RAID subsystem.



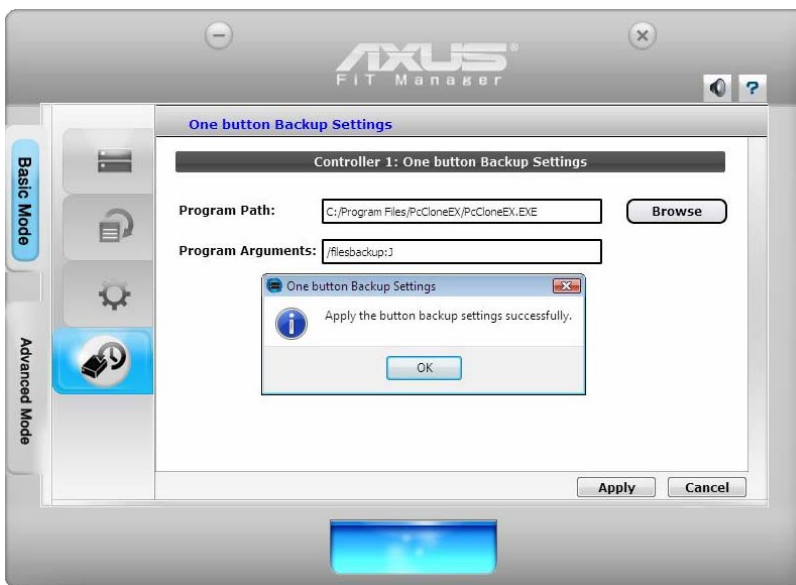
Click **Browse** to select the program path of backup application.



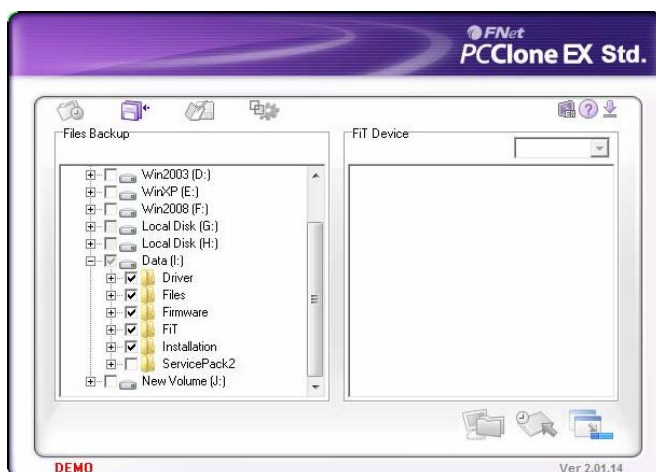
For example, select “PCClone EX” as the one button backup application.



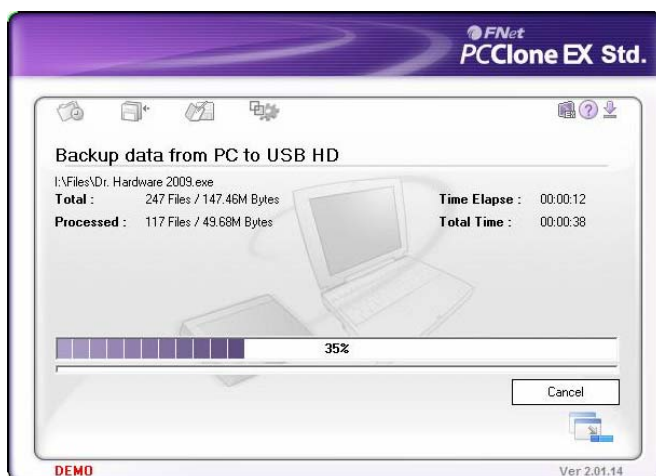
Fill in “Program Arguments” with path **/filesbackup:X**. X is the drive letter where the data was backup to. In this case, drive **J:** is the backup target.



Click **Apply** to complete settings and an information message would pop out and click "OK".



Before starting backup data, users need to select source data in the backup application as example.



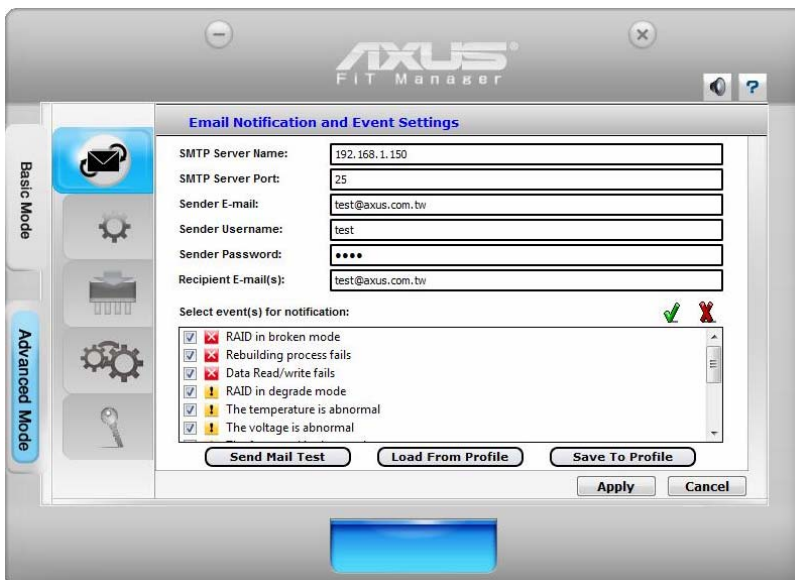
Press **"Set/Mute/Backup"** button to start backup data and a processing bar would appear.



Advance Mode

Five function tags at left side: Email Notification and Event Settings, Advanced RAID Configuration, Firmware Information, RAID Settings and Key Management. Central window shows the main configurations of **FiT** RAID subsystem.

■ Email Notification and Event Settings

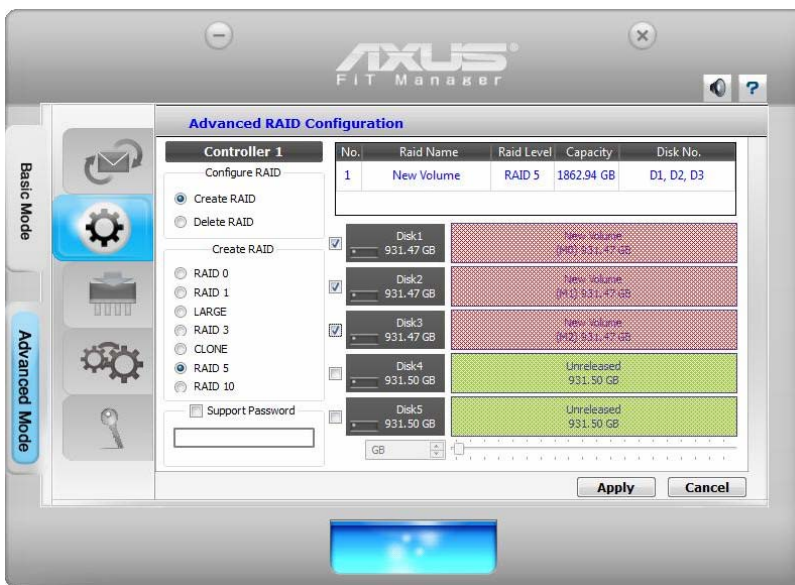
In “Email Notification and Event Settings”, user can setup an email address to receive events. According to urgent level, users can select what type of events they want to receive. In addition, users can save the settings as a template and load it to other **FiT** RAID subsystems.



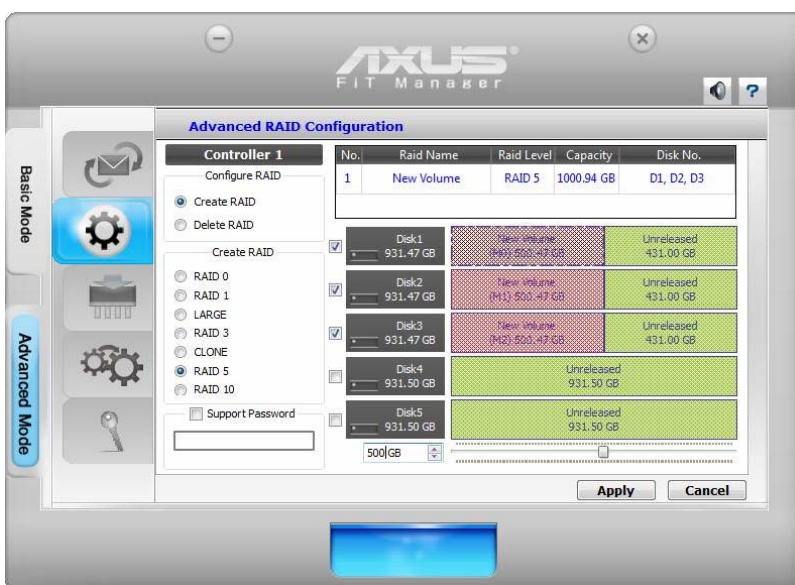
Complete the settings of the mail server then select events that users are able to receive an email notification. Click  to select all of events and  to deselect them all.

■ Advanced RAID Configuration

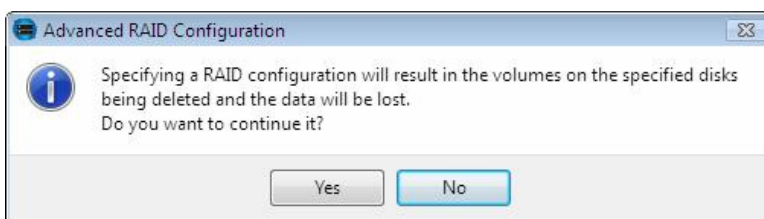
In “Advanced RAID Configuration”, users can select available hard disks to create one or more RAID volumes. Users can also modify the capacity size when creating each RAID volume. Depends on different RAID modes, **FiT** RAID subsystem allows users to create up to 5 volumes and the hard disk without RAID configuration on it (unreleased hard disk) would become hot spare disk automatically.



Select "Create RAID" first in "Configure RAID" then decides one of RAID modes to create the RAID volume. Select available hard disks to create a RAID volume.



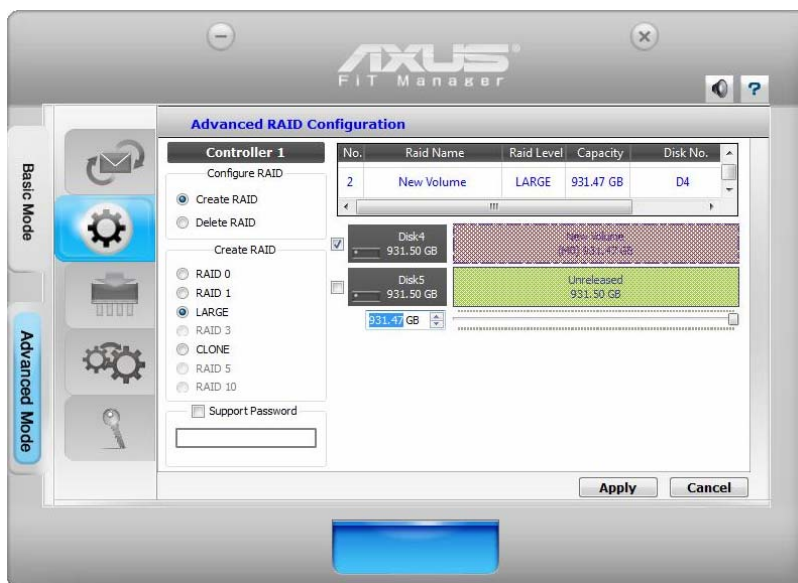
Red section presents the capacity used by the RAID volume and the green section presents the unused capacity. **Click** the red section to adjust the capacity of each hard disk used by the RAID volume. Click **Cancel** if you want to stop creating RAID volume.



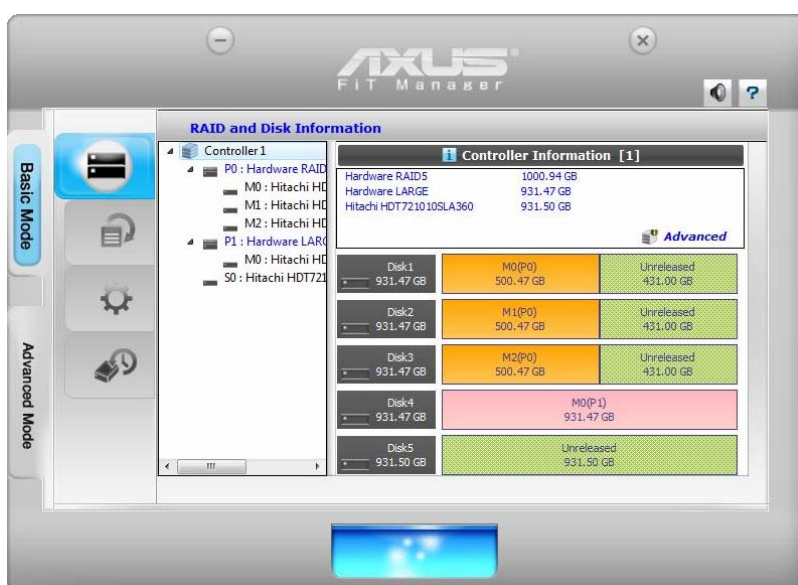
Click **Apply** to start creating the RAID volume and a confirmation window would pop out. Click **Yes** to complete the configuration or click **No** to stop the procedure.



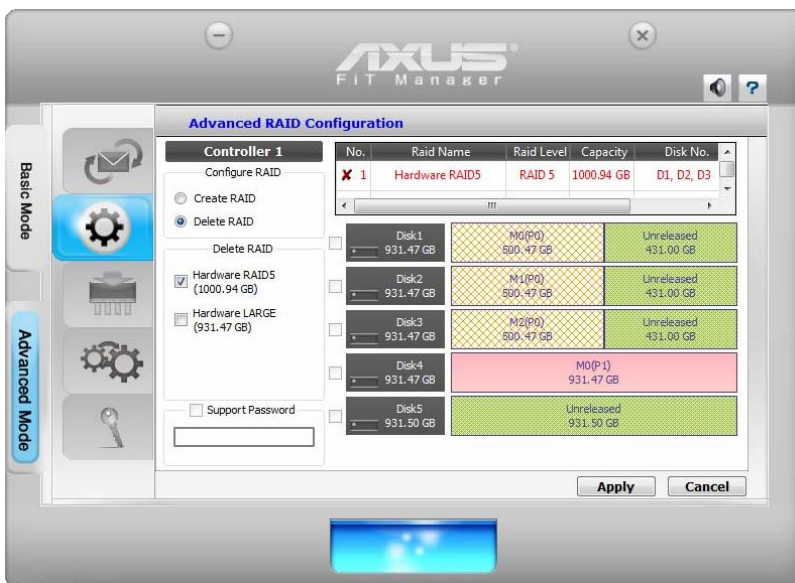
Once the RAID volume is created successfully, an information message would pop out and click "OK".



The RAID volume information which includes RAID level, capacity and member disks shows at top. Repeat the same steps to create the second RAID volume and **FiT** RAID subsystem only shows unused hard disks for creating RAID volumes.



The unreleased hard disk would become a hot spare disk automatically.



To delete RAID volumes, select “DELETE RAID” in “Configure RAID” then choose the RAID volume which you want to delete. The selected RAID volume information would show as red and come with an X mark. Click **Cancel** if you want to stop deleting RAID volumes. Click **Apply** to delete the selected volume and follow the instruction to complete procedures.

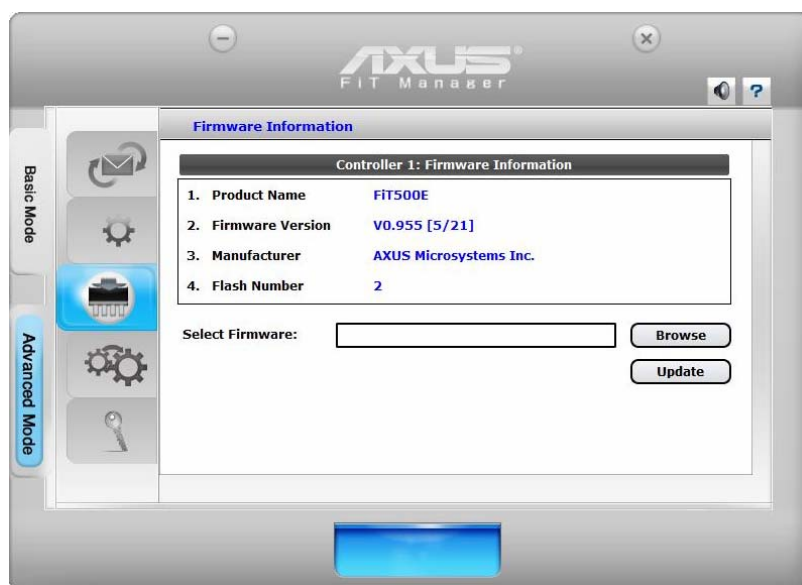


IMPORTANT!

FiT allows only one RAID configuration on each hard disk and unused capacity would be invisible to the host computer.

■ Firmware Information

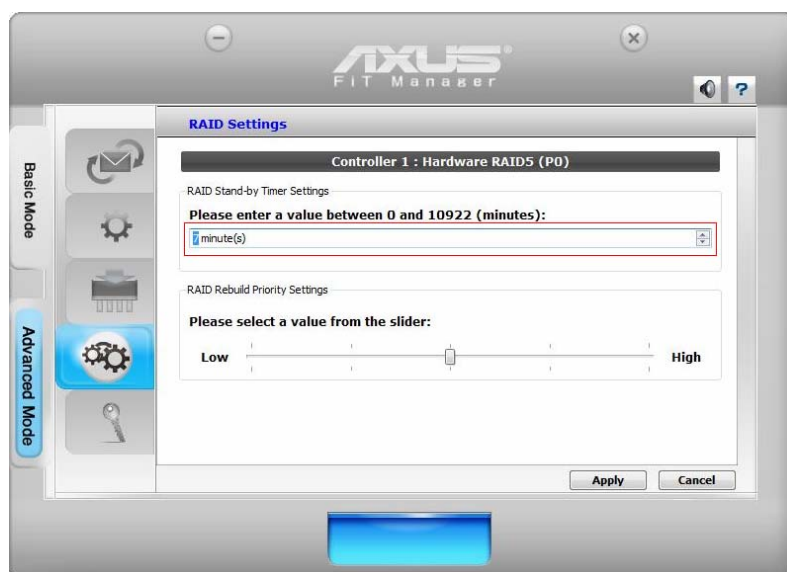
Except firmware version, “Firmware Information” also shows relative information about RAID subsystem and vendor manufacturer.



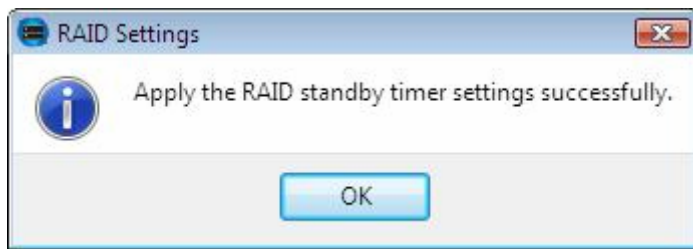
To update firmware, click **Browse** to select the firmware version you want to update. Click **Update** to proceed updating firmware.

■ RAID Settings

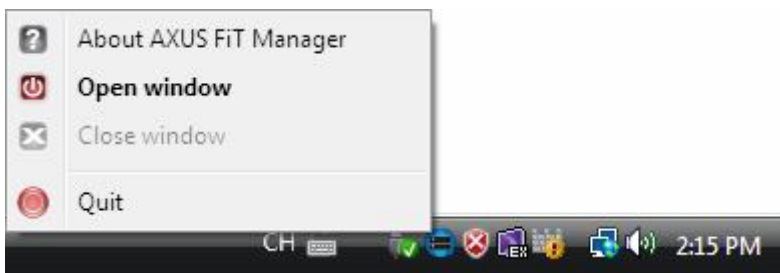
RAID Settings allows users to setup the Stand-by Timer and rebuilding priority of **FiT** RAID subsystem. Stand-by Timer is designed for saving power consuming. Setup Stand-by Timer to force FiT RAID subsystem becoming stand-by mode which would consume less electricity than normal status. About rebuilding priority setting, it provides users different balances between data I/O and background rebuilding task of **FiT** RAID subsystem.



To enable Stand-by Timer, setup an idle time (no I/O access) before **FiT** RAID subsystem becoming stand-by mode. 0 minute presents that Stand-by Timer is off.



Click **Apply** to complete the setting and a confirmation window would pop out.

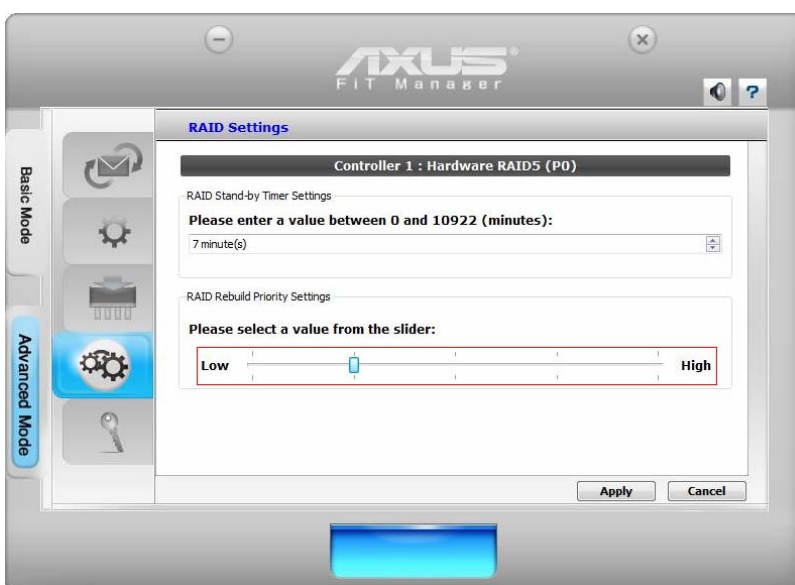


Quit Fit Manager, and **FiT RAID** subsystem will become stand-by mode after it stays idle status.

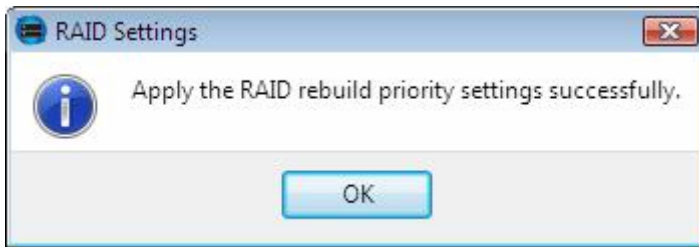


IMPORTANT!

Without quit **FiT Manager**, **FiT RAID** subsystem would not become stand-by mode.



Move the rebuilding priority bar to decide how prior that background rebuilding task would be. Lower rebuilding priority offers better I/O performance while **FiT RAID** subsystem is during rebuilding.



Click **Apply** to complete the setting and a confirmation window would pop out.

■ Key Management

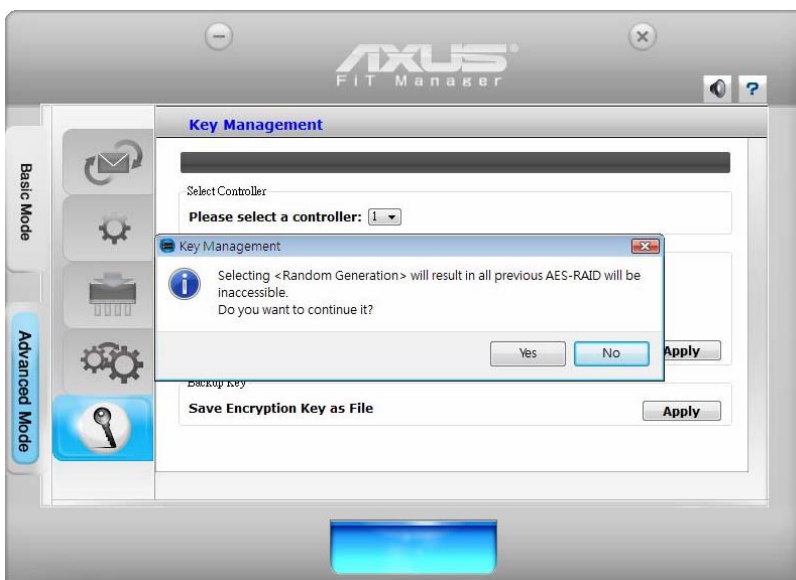
FiT RAID subsystems integrate real-time data encryption/decryption function without I/O performance down when accessing RAID volumes. The encryption algorithm implemented by **FiT** is based on AES (*Advanced Encryption Standard*) with a key length of 256-bit. The encryption key saved in AES key can be copied to another AES key or saved as a file for backup. It allows users to keep their important data from stolen or malicious damage.

Before creating AES-RAID volumes, users need to select a source to make key when they first get a non-encrypted AES key. Also, the encryption key already located in AES key can be saved as a file for backup. Key Management includes:

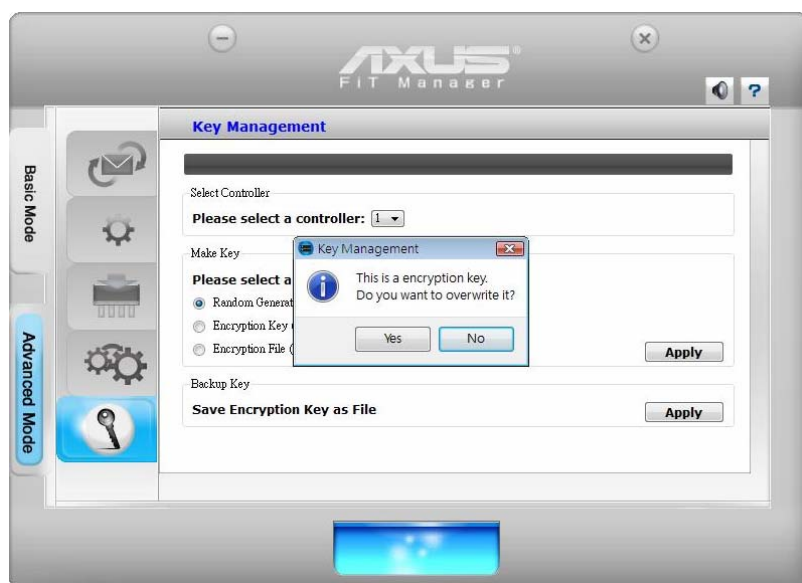
Select Controller	Select a specific FiT controller for making encryption key.
Make Key (select source)	Random Generation: A new key is randomly generated by FiT . It is usually used when users first get a non-encrypted AES key.
	Encryption Key: Duplicate an identical encrypted AES key from a physical key. It is usually used when users have other backup AES keys (optional).
	Encryption File: Duplicate an identical encrypted AES key from a file. It is usually used when users have other backup AES keys (optional) or restore the original key in case it is missing.
Backup Key	Save AES key as an encryption file for backup.



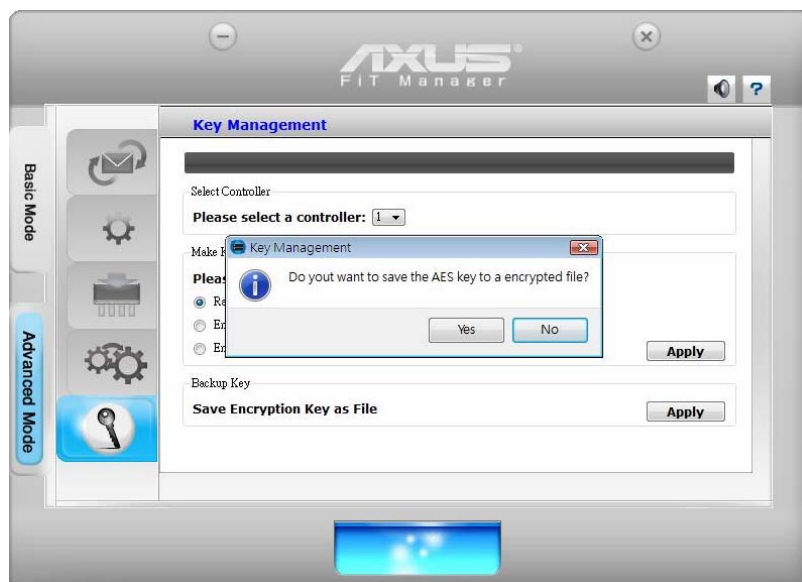
Plug AES key into the AES key port. Select a FiT controller# which you want to encrypt. Then select a source to make AES key as an encrypted key then click **Apply**. For example, select “**Random Generation**” to generate a new key for a non-encrypted AES key.



Click **Yes** to complete making key or click **No** to stop procedure.



If the AES key is encrypted already, a warning message would pop out. Click to overwrite the original AES key or click to stop procedure.



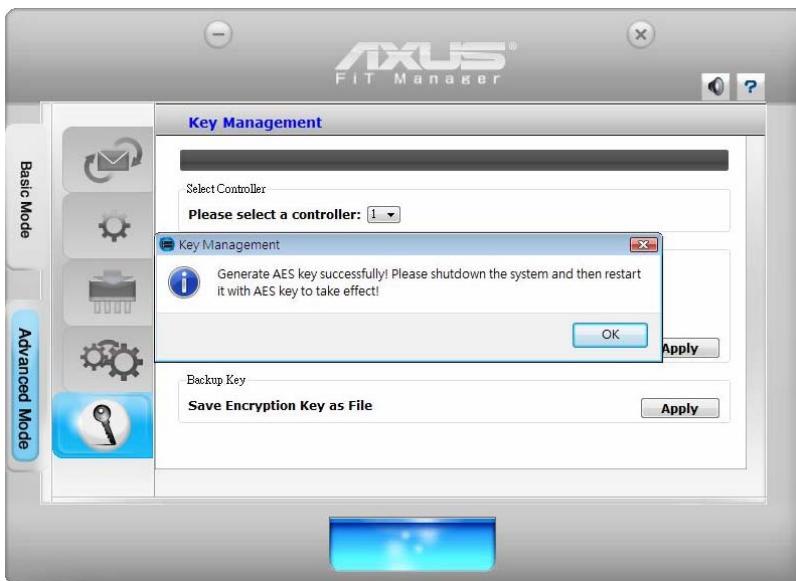
If AES key is made successfully, a confirmation window would pop out. Click to save AES key as an encryption file or click to next.



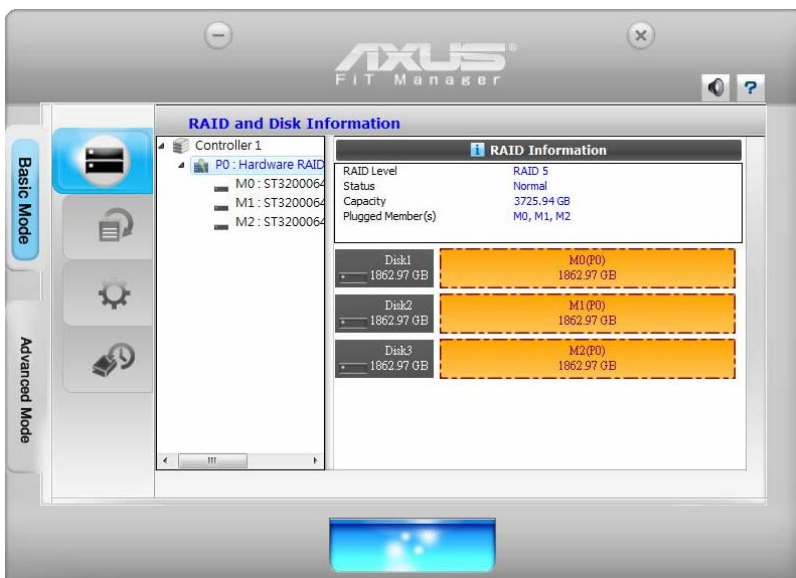
IMPORTANT!

Must Be Careful! AES-RAID volumes encrypted by the original AES key would become inaccessible if the key was overwritten.

Strongly recommend users to save AES key as an encryption file. It can avoid AES-RAID volumes become inaccessible in case AES key is missing.



Must reboot FiT with AES key plugged to take effect. Create AES-RAID volumes after FiT startup.

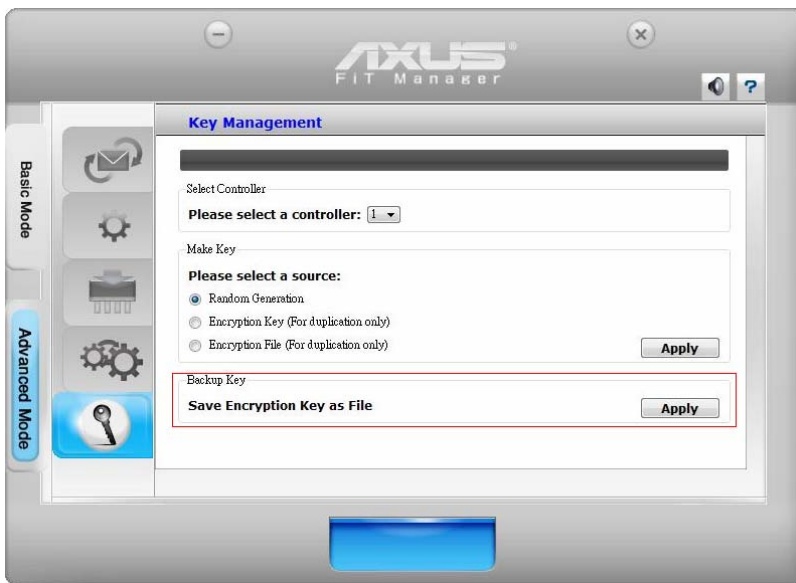


Create an AES-RAID volume with a gold key mark on it which presents the RAID volume is already encrypted. If FiT startup without the relative AES key next time, AES-RAID volumes would come with a gray key mark on it and become inaccessible on host computers.

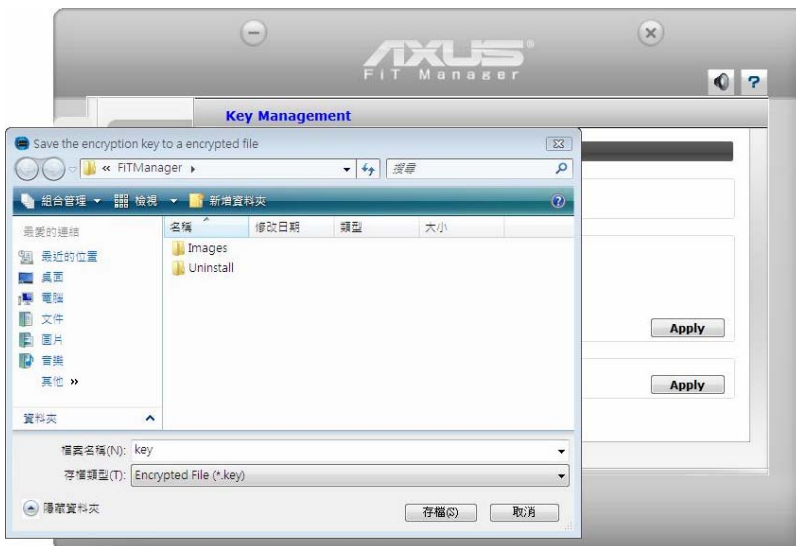


NOTE!

If your next RAID volume is *not* encrypted necessary, please reboot FiT without AES key plugged.



For backup AES key, click **Apply** to save the encryption key as file.



Name the encryption file and locate it in safe. It can be used to restore to optional AES key in case the original one is missing.



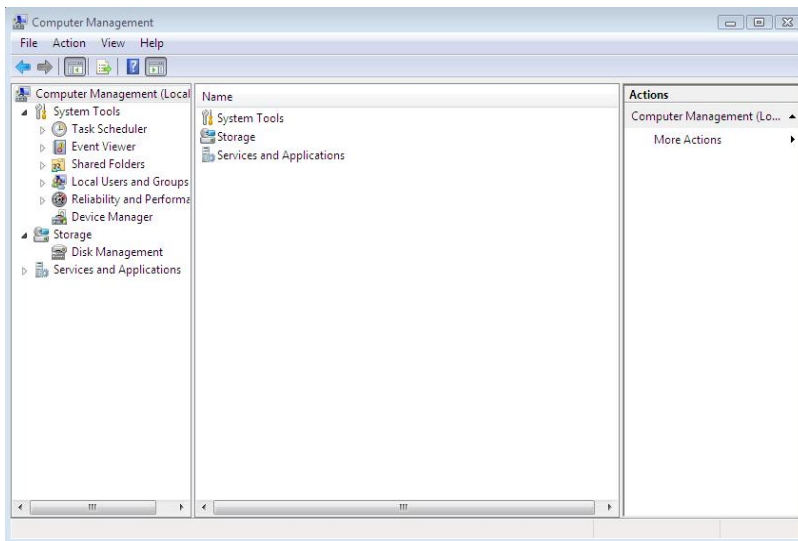
NOTE!

Please contact AXUS for the information about optional AES key if necessary.

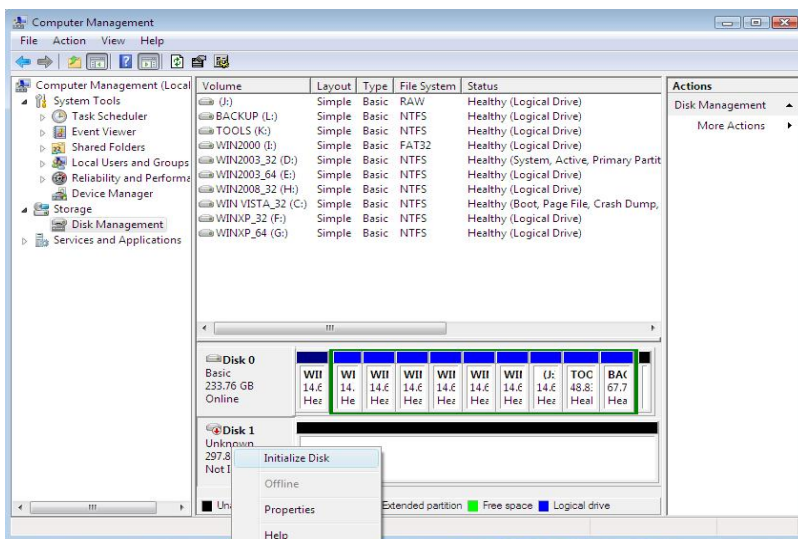
Chapter 4 Formatting, partitioning and removing the disk

Once your RAID volume is created via any method as description above, you have to format the disk device and partition the volume before start using it. The method for different operation systems is described as below:

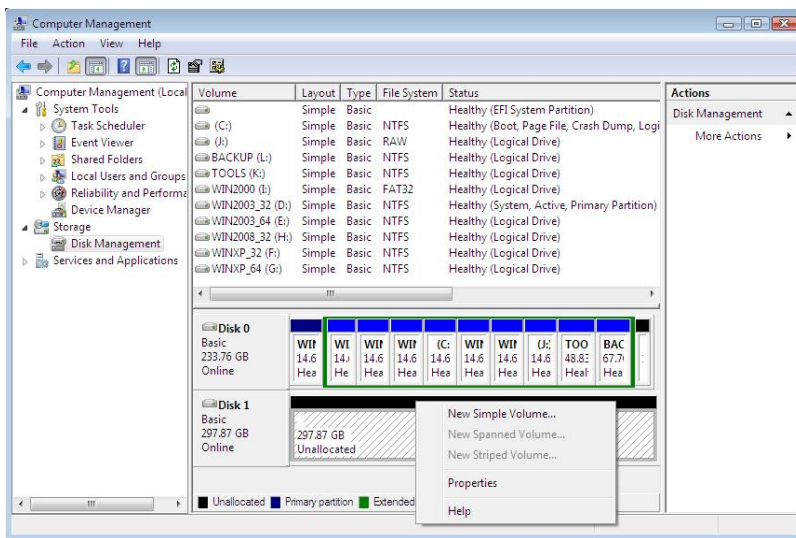
For Microsoft Windows Users



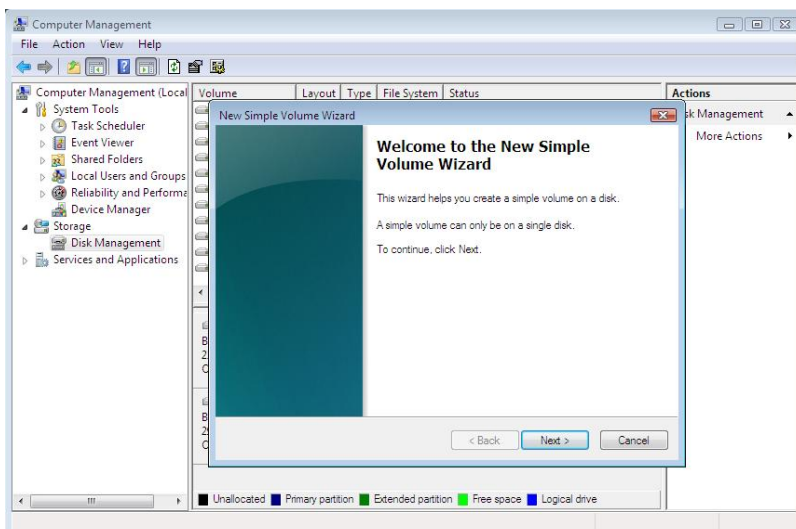
Right click **My Computer** icon on the desktop and select **Manage** from drop down menu to open **Computer Management** utility.



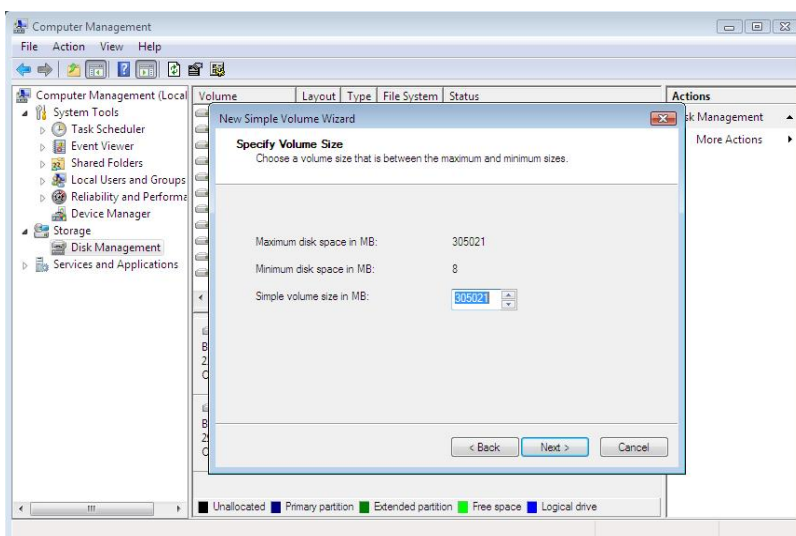
Click Disk Management at left panel. AXUS RAID volume is recognized as Disk 1 in console. Right click on Disk 1 and select **Initialize Disk** from the pull-down menu. Follow the wizard to complete the initialization.



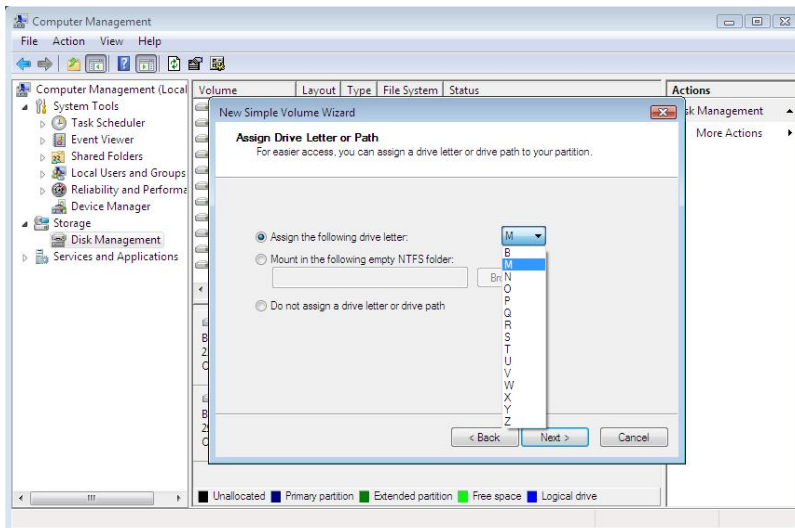
Right-click on the Disk 1 “Unallocated” bar and select New Simple Volume from the pull-down menu.



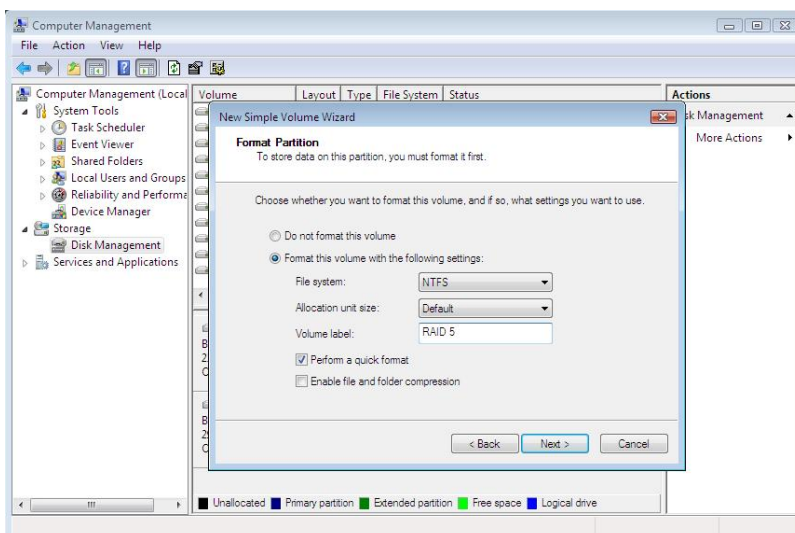
A **New Simple Volume Wizard** window would pop out and click **Next** to continue.



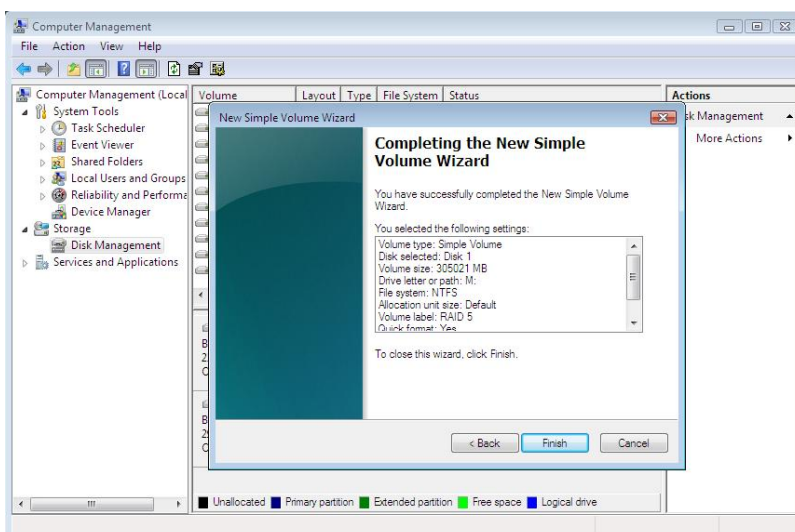
Follow the instruction to specify your volume size then click **Next**.



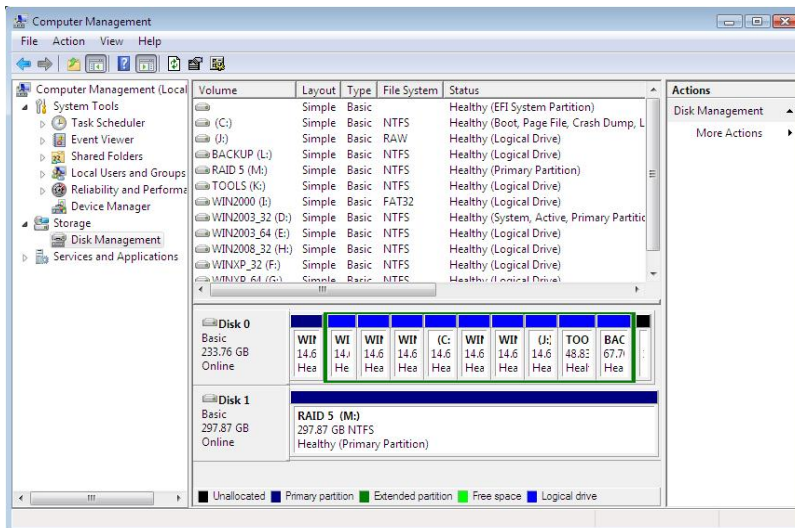
Windows Vista would automatically assign a drive letter or you can choose one from drop menu to the new volume then click **Next**.



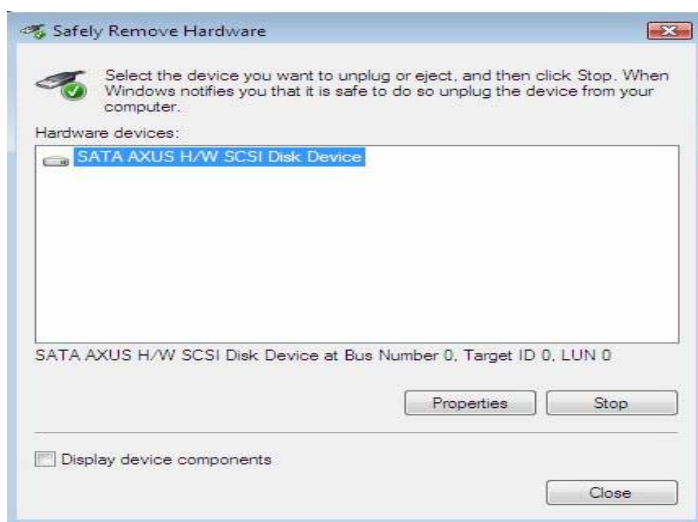
Enter a Volume Label, e.g. RAID 5 and check the **Perform a quick format** option then click **Next** to continue.




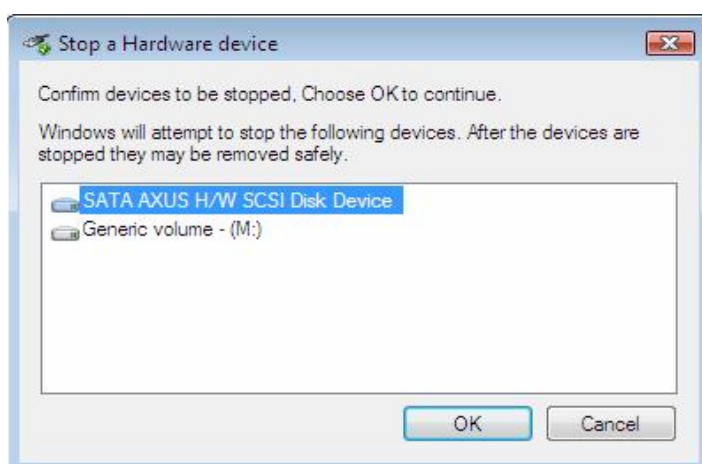
Wizard would show the information about the new volume and click **Finish** to complete the procedure.



In Disk Management console, a new volume: RAID5(M:), is created successfully for use.



To remove the RAID volumes, right click  and click "Safely Remove Hardware".



Select either the volume label or AXUS Disk Device to remove the RAID volume then click "OK".



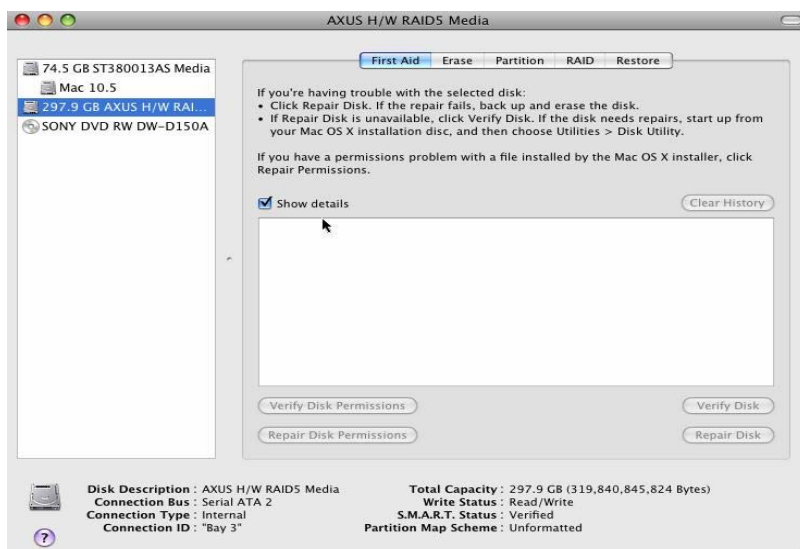
An information window would pop out and you can disconnect or power off **FiT RAID** subsystem.



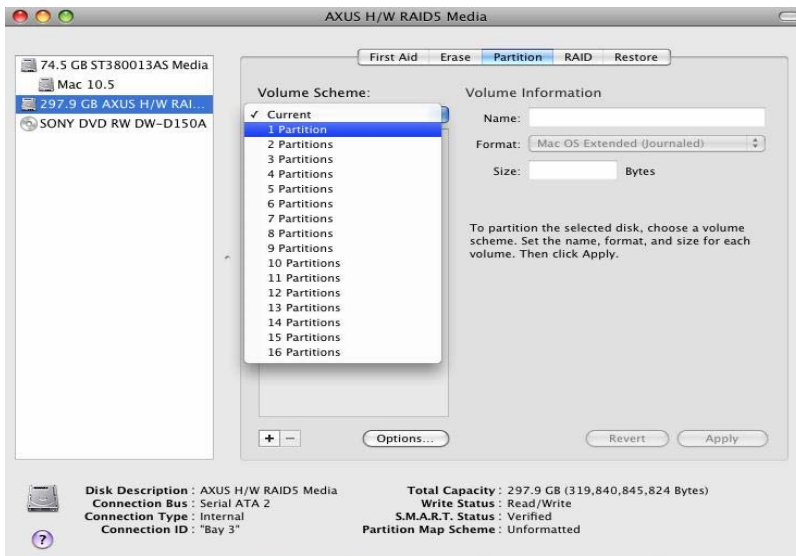
IMPORTANT!

Not all of eSATA interfaces support hot plug function and AXUS strongly recommend users to power off the host computer before disconnecting or removing **FiT RAID** subsystem via eSATA port.

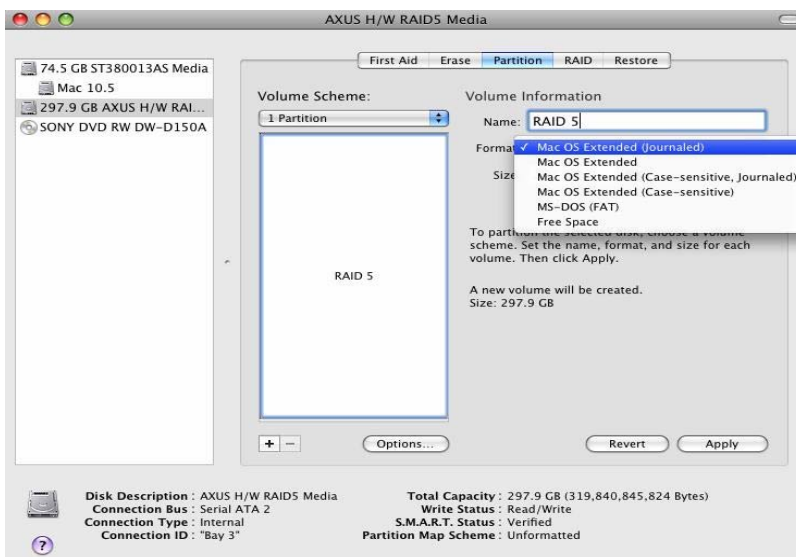
For Mac OS X Users



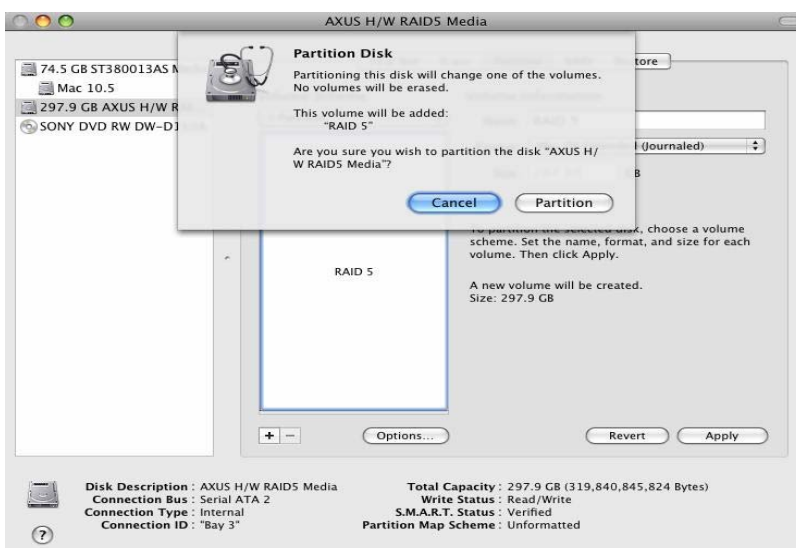
Open the Apple Disk Utility. Select “AXUS H/W RAIDX Media” and the information about it would be displayed at bottom.




Click **Partition** tab to create one or more partitions.



Follow the instruction to setup partitions, such as name, size and format. Then click **Apply** to continue.



Click **Partition** button to complete procedure.

A new volume  would appear on the desktop for use.

For Linux Users

```

root@localhost:~
File Edit View Terminal Tabs Help
[root@localhost ~]# fdisk -l

Disk /dev/hda: 250.0 GB, 250059350016 bytes
255 heads, 63 sectors/track, 30401 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1 *          1           5099     40957686    7  HPFS/NTFS
/dev/hda2            5100        30400    203230282+   f  W95 Ext'd (LBA)
/dev/hda5            5100        17847    102398278+   7  HPFS/NTFS
/dev/hda6           25496        30400     39399381    7  HPFS/NTFS
/dev/hda7           17848        21416     28667961   83  Linux
/dev/hda8           21417        21543     1020096    82  Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]#

```

Open terminal and run command “fdisk -l” to check disk device.

```

root@localhost:~
File Edit View Terminal Tabs Help
[root@localhost ~]# fdisk -l

Disk /dev/hda: 250.0 GB, 250059350016 bytes
255 heads, 63 sectors/track, 30401 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1 *          1           5099     40957686    7  HPFS/NTFS
/dev/hda2            5100        30400    203230282+   f  W95 Ext'd (LBA)
/dev/hda5            5100        17847    102398278+   7  HPFS/NTFS
/dev/hda6           25496        30400     39399381    7  HPFS/NTFS
/dev/hda7           17848        21416     28667961   83  Linux
/dev/hda8           21417        21543     1020096    82  Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

```

Run command “fdisk /dev/sda” to partition device.

```

root@localhost:~
File Edit View Terminal Tabs Help
/dev/hda8            21417        21543     1020096    82  Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

The number of cylinders for this disk is set to 19442.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n

```

Type “n” to create a new partition table.

```

root@localhost:~
File Edit View Terminal Tabs Help
WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

The number of cylinders for this disk is set to 19442.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p

```

Type “p” or “e” to create a primary partition or an extended partition. Follow the instruction to complete creating partitions.

```

root@localhost:~
File Edit View Terminal Tabs Help
t GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

The number of cylinders for this disk is set to 19442.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1

```

```

root@localhost:~
File Edit View Terminal Tabs Help

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

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 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-19442, default 1):

```



```

root@localhost:~
File Edit View Terminal Tabs Help
Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

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   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-19442, default 1):
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-19442, default 19442): █

```

```

root@localhost:~
File Edit View Terminal Tabs Help

   Device Boot      Start         End      Blocks   Id  System
[root@localhost ~]# fdisk /dev/sda

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

The number of cylinders for this disk is set to 19442.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-19442, default 1):
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-19442, default 19442):
Using default value 19442
Command (m for help): w █

```

Type “w” to write the partition table to device.

```

root@localhost:~
File Edit View Terminal Tabs Help

t GPT. Use GNU Parted.

The number of cylinders for this disk is set to 19442.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
 1) software that runs at boot time (e.g., old versions of LILO)
 2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-19442, default 1):
Using default value 1
Last cylinder or +size or +sizeM or +sizeK (1-19442, default 19442):
Using default value 19442

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
[root@localhost ~]# █

```

```

root@localhost:~# fdisk -l

Disk /dev/hda: 250.0 GB, 250059350016 bytes
255 heads, 63 sectors/track, 30401 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1 *           1           5099     40957686    7  HPFS/NTFS
/dev/hda2             5100        30400    203230282+    f  W95 Ext'd (LBA)
/dev/hda5             5100        17847     102398278+    7  HPFS/NTFS
/dev/hda6          25496        30400      39399381    7  HPFS/NTFS
/dev/hda7          17848        21416     28667961    83  Linux
/dev/hda8          21417        21543      1020096    82  Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            1        19442    156167833+    83  Linux

```

Run command “fdisk -l” to check the partition /dev/sda1.

```

root@localhost:~# fdisk -l

Disk /dev/hda: 250.0 GB, 250059350016 bytes
255 heads, 63 sectors/track, 30401 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1 *           1           5099     40957686    7  HPFS/NTFS
/dev/hda2             5100        30400    203230282+    f  W95 Ext'd (LBA)
/dev/hda5             5100        17847     102398278+    7  HPFS/NTFS
/dev/hda6          25496        30400      39399381    7  HPFS/NTFS
/dev/hda7          17848        21416     28667961    83  Linux
/dev/hda8          21417        21543      1020096    82  Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 159.9 GB, 159920422912 bytes
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            1        19442    156167833+    83  Linux

```

Run command “mkfs” to format /dev/sda1.

```

root@localhost:~# mkfs /dev/sda1

Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1            1        19442    156167833+    83  Linux

```

mke2fs 1.35 (28-Feb-2004)
 Filesystem label=
 OS type: Linux
 Block size=4096 (log=2)
 Fragment size=4096 (log=2)
 19529728 inodes, 39041958 blocks
 1952097 blocks (5.00%) reserved for the super user
 First data block=0
 Maximum filesystem blocks=41943040
 1192 block groups
 32768 blocks per group, 32768 fragments per group
 16384 inodes per group
 Superblock backups stored on blocks:
 32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
 4096000, 7962624, 11239424, 20480000, 23887872

Writing inode tables: done
 Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 32 mounts or
 180 days, whichever comes first. Use tune2fs -c or -i to override.

```

root@localhost:~
File Edit View Terminal Tabs Help
255 heads, 63 sectors/track, 19442 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1        1         19442     156167833+   83   Linux
[root@localhost ~]# mkfs /dev/sda1
mke2fs 1.35 (28-Feb-2004)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
19529728 inodes, 39041958 blocks
1952097 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=41943040
1192 block groups
32768 blocks per group, 32768 fragments per group
16384 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872

Writing inode tables: done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 23 mounts or
180 days, whichever comes first. Use tune2fs -c or -i to override.
[root@localhost ~]# mkdir /mnt/RAID5

```

Run “mkdir” to create a directory /mnt/RAID5 for a mount point.

```

root@localhost:~
File Edit View Terminal Tabs Help
Units = cylinders of 16065 * 512 = 8225280 bytes


   Device Boot      Start         End      Blocks   Id  System
/dev/sda1        1         19442     156167833+   83   Linux
[root@localhost ~]# mkfs /dev/sda1
mke2fs 1.35 (28-Feb-2004)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
19529728 inodes, 39041958 blocks
1952097 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=41943040
1192 block groups
32768 blocks per group, 32768 fragments per group
16384 inodes per group
Superblock backups stored on blocks:
    32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
    4096000, 7962624, 11239424, 20480000, 23887872

Writing inode tables: done
Writing superblocks and filesystem accounting information: done

This filesystem will be automatically checked every 23 mounts or
180 days, whichever comes first. Use tune2fs -c or -i to override.
[root@localhost ~]# mkdir /mnt/RAID5
[root@localhost ~]# mount /dev/sda1 /mnt/RAID5

```

Run command “mount” to mount /dev/sda1 at /mnt/RAID5.

A new media device  would appear on desktop for use.

```

root@localhost:~
File Edit View Terminal Tabs Help
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/hda1        *           1         5099      40957686   7   HPFS/NTFS
/dev/hda2          5100        30400     203230282+   f   W95 Ext'd (LBA)
/dev/hda5          5100        17847     102398278+   7   HPFS/NTFS
/dev/hda6        25496        30400      39399381   7   HPFS/NTFS
/dev/hda7        17848        21416     28667961   83   Linux
/dev/hda8        21417        21543     1020096   82   Linux swap

Partition table entries are not in disk order

WARNING: GPT (GUID Partition Table) detected on '/dev/sda'! The util fdisk doesn't support GPT. Use GNU Parted.

Disk /dev/sda: 319.8 GB, 319840845824 bytes
255 heads, 63 sectors/track, 38885 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1        1         19332     155284258+   83   Linux
[root@localhost ~]# umount /dev/sda1
[root@localhost ~]#

```

To remove the RAID volume, run command “umount” to unmount /dev/sda1 then you can disconnect or power off FiT RAID subsystem.

Limited Warranty

AXUS warrants to the original purchaser that all the hardware product shall be free from defects in material and workmanship from the date of purchase to the corresponding standard warranty period. AXUS, at its expense and option, shall either repair or replace any products or part thereof which is proven defective under the warranty period. Replacement, if required, shall be with new, comparable, or reconditioned products.

THIS LIMITED WARRANTY DOES NOT COVER MISUSE OR MINOR IMPERFECTIONS IN UNITS THAT MEET DESIGN SPECIFICATIONS OR IMPERFECTIONS THAT DO NOT MATERIALLY AFFECT FUNCTIONALITY.

THIS LIMITED WARRANTY DOES NOT COVER AND AXUS IS NOT RESPONSIBLE FOR:

- Damages caused by misuse, abuse, accidents, fire, theft, disappearance, misplacement, power surges, viruses, reckless, willful or intentional conduct.
- Damages caused by servicing not authorized by AXUS.
- Damages caused by usage that is not in accordance with product instructions.
- Damages caused by failure to follow the product instructions or failure to perform preventive maintenance.
- Data loss due to any defective hardware or necessary for repairing **FiT RAID** Subsystems.

Technical Support

The scope of technical support consists of helping you to diagnose and resolve problems with detects in **FiT RAID** Subsystems. If you encounter any difficulties while installing **FiT RAID** Subsystem, please contact AXUS Technical Support via one of the following ways:

Telephone: 886-2-32348686

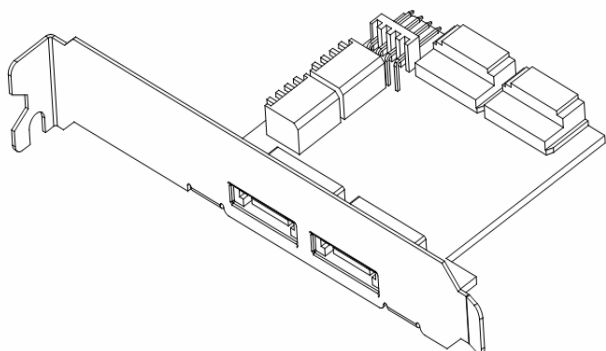
Fax: 886-2-32341515

E-mail: support@axus.com.tw

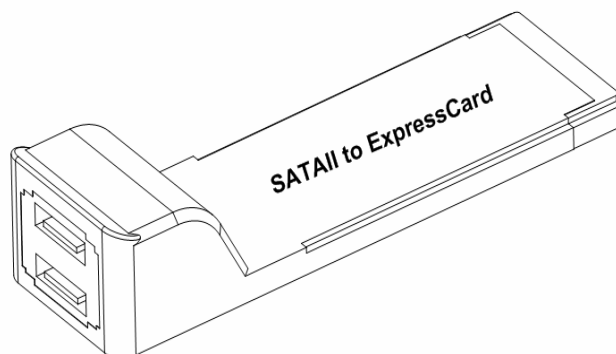
URL: <http://www.axus.com.tw>

Appendix A

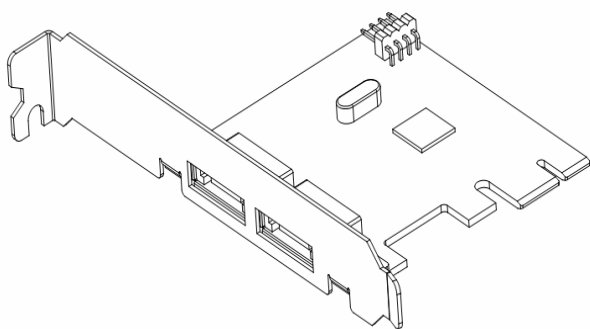
AXUS provides users optional accessories to enhance performance and capability of FiT RAID subsystems. Not only desktop PCs or Mac computers but also laptop users can easily utilize FiT RAID subsystems to protect their data and get outstanding I/O performance. Optional accessories show as below:



Redriver Card is designed to provide a more stable signal. It supports two eSATA ports for connecting multiple **FiT** RAID subsystems.



eSATA express/43 Card with 1-lane 2.5Gb/s PCI Express interface is designed for laptop users. It supports two eSATA ports for connecting multiple **FiT** RAID subsystems.



PM Card with PCIe x1 interface is designed to provide host computers recognizing multiple logical volumes. It supports two eSATA ports for connecting multiple **FiT** RAID subsystems.